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VIEWPOINT

Name Of The Game

The old rules on system price/performance ratios could be on their way out. It may no longer be cost-effective to run applications on large systems in order to take advantage of their economies of scale. "Downsizing" is the name of the game now, analysts at a recent International Data Corp. conference have indicated. While some applications can only be suited to run on mainframe systems, these systems often offer the worst price/performance ratios of all current systems. Many common applications can be brought down to smaller systems such as superminis, minis and personal computers that offer very good price/performance ratios, IDC noted.

If in fact these economies of scale hold true, as they certainly seem to, organizations will need to adjust their planning and purchasing strategies. Part of the slowdown in personal computer purchases has been attributed to organizations taking a look at their current micros and accompanying expenditures from a cost-efficient standpoint and finding them inefficiently used. Bringing applications down to the PCs will increase usage and efficiency — a persuasive argument in selling management on equipment purchases. The possible benefits from this downsizing strategy could prove difficult to ignore and could also prove a real competitive advantage.

A further argument for off-loading more work on to PCs is the downward cost structure. Prices that on some micros are estimated to go as low as \$1,000, may soon become no more than commodity items. Even the price for the IBM Personal Computer AT compatible systems are expected to start sliding due to new, more sophisticated chip sets and the new Intel Corp. 386 microprocessor.

While this will undoubtedly wreak havoc with the smaller vendors and even cause sleepless nights for those bigger players who have never successfully made it into the market, it should prove a real windfall for buyers.

On The Technology Front

Although little seems to be happening on the technology front these days, at least one new buzzword is beginning to crop up. Compact Disk-Read Only Memory (CD-ROM) appears to be heading for user and market attention. The recent CD-ROM conference in Seattle, sponsored by Microsoft Corp., was a positive step for users as an attempt was begun to set standards and open up formats for software development. This may be one technology that will quickly move from promise to reality. And kudos belong to those involved vendors for attempting a well-thought out, strategic approach to product development before bringing it to market.



PC Frankenstein



INSIDER

By Timothy J. Caffrey

Five years ago at this time the industry was abuzz with speculation that IBM would introduce a new desktop computer. The August 1981 announcement of the Personal Computer redefined microcomputing and changed the shape and direction of the computer industry. One change that no one anticipated is now apparent: IBM has lost control of its desktop creation.

You need look no further than the Internal Revenue Service's February portable computer announcement for an understanding of IBM's Frankenstein. To the surprise of many, the IRS selected the Zenith Data Systems Corp. Z-171, a repackaged version of the Morrow Designs, Inc. Pivot.

The pundits were sure that IBM would win the award, but a look at some fundamental trends reveals how difficult it is for IBM to compete in the market it created.

It is a misnomer to claim that IBM owns the desktop market. In fact, the Intel Corp./Microsoft Corp. architecture owns the desktop market: IBM simply sells more Intel/Microsoft-based systems than anybody else.

This contention is supported by two facts. First, Microsoft's MS-DOS operating system and Intel's microprocessors have emerged as the targets of an unprecedented array of hardware and software development efforts. The open system philosophy that IBM initially encouraged has produced an industry that moves outside of IBM's influence. Buyer actions underscore a second indicator of the new IBM-independent personal computing standard.

At the IRS and other organizations large and small, personal computer acquisitions are based on the following three broad criteria:

- Systems must be IBM-compatible. This means they must run most software currently designed for the Intel/Microsoft system sold by IBM.
- Systems under consideration must be backed by a stable service and support structure. In other words, concern about vendor viability never goes away. So far, IBM is not threatened.

• Price is the third main buying criterion, and this is where IBM loses business to Zenith and others. There is a growing perception on the part of buyers that the PC is not worth the price premium it demands.

A few years ago, IBM was justifiably viewed as the only safe vendor. Today, companies like Compaq Computer Corp., Zenith, Tandy Corp. and a handful of others all represent safe choices: these companies are geared to operate on profit margins that IBM would find difficult to stomach.

Conventional wisdom states that IBM can fight back by closing the Intel/Microsoft standard system, effectively making competition from clones more difficult and costly. Possible closing strategies include restricting third-party access to Intel/Microsoft products or moving toward a firmware-based operating environment. Both strategies assume that the buying public is willing to go along with the changes. That is not likely.

The Intel/Microsoft personal computer is a desktop standard. It represents a stable target for software, peripheral and clone development. The depth and quality of these developments are part of IBM's success. Tempering with that momentum could open the door for competing architectures.

The danger of losing third-party development momentum is just one of the issues facing IBM planners. Equally important is the enormous user investment in training and software for the Intel/Microsoft system. Buyers facing the costs of software migration and retraining might not be willing to follow IBM into proprietary territory.

Both of these issues are indicative of the pressures facing IBM strategists. It may in fact be too late to shift desktop product strategies. An abrupt move runs the risk of disenfranchising a large number of buyers. Acting too slowly allows the IBM alternatives to gain additional momentum.

The likely outcome is for a continued "commodification" of the Intel/Microsoft architecture. For an industry anchored in proprietary systems, the desktop truly represents new competitive territory.

Caffrey is director, strategies for micro and office systems, for International Data Corp. in Framingham, Mass.

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VIEWPOINT

Micro Guru Predicts Future of Industry



Q&A

By Portie Isaacson

Portie Isaacson has been involved in the micro industry since 1974 when "the Altair was on the cover of Popular Electronics." She was the founder of Richardson, Texas-based Future Computing, Inc. Presently, she is vice-chairman of Future Computing, president of the merger and acquisition firm, Isaacson, Inc., a director of Microsoft Corp. and chairman of Intellisys. Intellisys is involved with developing software to control automated houses and is using Isaacson's totally computerized home as a laboratory. Isaacson noted, "While some people might unkindly call it the lunatic fringe, I like to think it's on the leading edge. And we're dead serious about it." Isaacson spoke to ComputerWorld Focus about where the micro industry has been and where it's going.

Has the past 12-month period been one of taking stock?

It certainly has. I became involved in mergers and acquisitions in the personal computer industry because I felt it was time for consolidation. Three years ago a software company with a vague idea of what it wanted to do could almost get venture capital on the phone. There have been too many me-too software companies funded that came out with just another database or spreadsheet, products that were merely evolutionary. But when they got to the market, they could not distinguish their software product from anybody else's. Even if they could, communicating the difference would require

far more advertising money and cleverness in positioning and public relations than most of them were capable of.

What about the hardware side?

It seemed as if every manufacturing company looked at companies like Apple [Computer, Inc.] or Compaq [Computer Corp.] and said, "Gee, this is really easy," as if you just throw a machine out there and all of a sudden you're the fastest growth business the world has ever seen. Well, it wasn't so easy. By the middle of 1984 all those companies finally entered the market and, although the end-user spending was growing nicely, a 10-year-old industry having 20% to 50% growth, there wasn't enough growth to support all of those casual entries into the market. For many of those companies to have met their expectations, the market would have had to grow 300% to 500%, and that's not possible for a 10-year-old industry.

Has the computer retailer been hurt by these overblown expectations?

The computer retailer is in a very bad way these days. That channel still serves roughly half of all the hardware and software products that are sold through to end users. But once IBM entered the market, each of the retailers felt the need to expand extremely rapidly to stake out turf, to get the IBM dealerships in as many cities as possible because they all felt that someday IBM would cut off dealer expansion. IBM has finally done that, but in my opinion it is two years too late because there are just not enough customers to support the number of stores. So in the past two years there has been incredible price competition, and the only fix for that was for IBM to stop dealer ex-

pansion and for some of those dealers to just plain go away. And they've been dropping like flies. In fact, if anyone is interested, I could probably make them a package deal if they'd buy the whole computer retail channel at once!

There has to be good news, doesn't there?

The computer retailers have been closing at a dramatic clip over the last four months. I think that will keep on for a couple more months, but in the summer I think we're going to see it turn. And this fall is going to be really strong for those computer retailers who make it through July. Those that are left will once again have a healthy business. The end users keep on buying. There is really no bad news if you look at the growth in end-user spending, the number of computers being bought and so on. The industry is expected to see in the neighborhood of 20% growth. That doesn't sound like a lot when we're used to seeing 80% like we did five years ago. 20% is very respectable if you compare it to other kinds of industries, even in the computer business.

What about the big three: Businessland, Entre and Computerland?

For each one of them it's a different answer. Businessland needs to continue its expansion, which means they're probably going to make a lot of acquisitions. They do a good job at serving the customer, which I think is key to long-term health. Entre's biggest problem has been its franchisees, almost an internal problem, and it looks like that is all worked out. I believe they have the financial wherewithal to stay healthy. Computerland is going to be one of the more interesting plays to watch. It seems like

they're making a lot of progress in cleaning up their act. The biggest problem is the health of the individual franchisees. Quite a few have been going under on some major markets. On the other, it's not out of proportion with the number of computer retailers we've lost outside of Computerland. Certainly they will be a corporation. In general, two kinds of retailers will survive: the really big ones we just talked about and the little guy who has one store and does one thing extremely well.

What about the health of the industry itself?

Well, the companies that shouldn't have been there in the first place have gone or are dying. There is not an oversupply of competitors anymore. We're going to continue to see some investment in the industry. Standards are generally clear now so that competitors know pretty much what to do. Nobody argues with the issue of being IBM-compatible, except Apple. I think we'll see a new wave of IBM products soon that will create some excitement in the end-user community. I'm worried about innovation in software because most of the innovations we have had have come from smaller, startup companies. I think we'll see the big companies like Lotus [Development Corp.], Ashton-Tate and Microsoft continue to have dramatic growth, and those companies in general are going to be very acquisition-oriented. Already Lotus and Ashton-Tate are on a rampage doing acquisitions. And I'm excited about CD-ROM. I was at the Microsoft CD-ROM conference and it was absolutely a Woodstock. I was so excited I bought a \$20,000 data base.

— Lee White

IBM's Strategy: Micro Revolution Phase II



BLUE BEAT

By Dale Kutnick

By now, most people involved in the desktop microcomputer or office automation business have recognized that the next significant phase in personal computer development will be logical interconnectivity with mainframes, minis, servers, networks and other micros. This logical networking implies that information, in its proper context, will be shared across different systems (cooperative processing) and offer common user interfaces, facilities, applications and information delivery tools. IBM has already begun this effort with cross system products like Displaywrite, Document Interchange Architecture, Document Content Architecture (DIA DCA), Interactive Financial Planning System (IFPS), Personal Services and so on.

Phase II will require sophisticated network software (far beyond the capabilities of current micro-to-mainframe links) and desktop micros that are significantly more powerful and versatile than the ones commonly in use today. This is, of

course, an attractive proposition to vendors like IBM, that hope to replace (or even displace) the current generation of PCs in the near-future with next generation hardware and software.

In this scenario, personal computers will increasingly become 1-plus millions of instructions per second (MIPS) professional workstations, supported by artificial intelligence and expert systems software, voice and graphics processing plus more integrated, networked applications. These workstations will also develop a healthier appetite for mainframe MIPS. The guts of IBM's Trojan Horse, to support increased utilization of R-IBMs, fourth-generation language compilation and application generation, corporate document handling and electronic mail plus network management and information center resources.

Market research indicates that each Active PC or 3270 workstation networked attached to 57,000 to 57,000 in mainframe resources such as software, processing power and people. Within three or four years, this number will likely double to about \$12,000, despite a 50% decline in the price of mainframe MIPS. This means more intensive use of more host-supported resources. In addition, the percentage

of PCs accessing mainframes will grow from under 37% in 1984 to over 73% in 1989.

This is the crux of IBM's Trojan Horse strategy: rapid proliferation of PCs in Phase I followed by connectivity and resource demands and sophisticated support, network software in Phase II. Products like APPC/PC LU 6.2, Netbios, VM, PC Bond, Decision Support/370, and Personal Services (PC, S/36, S/38, S/370) represent some of IBM's initial efforts in this area. Many more will follow, but IBM must first move users to more powerful and sophisticated PCs and software in order to accomplish its longer range integration strategies and to expand its PC revenue stream.

But IBM faces a major crisis in migrating its current lineage of PC users to the so-called promised land. IBM does not yet control the bulk of its PC installations because it has minimal control over their operating environments. Microsoft's PC-DOS does not necessarily accommodate IBM's longer term goals. This became painfully evident in 1985—and even more so during the first quarter 1986—to as IBM failed to persuade users to migrate to the more powerful and 40% plus more expensive Personal Computer AT because there was almost no soft-

ware to take advantage of its enhanced hardware capabilities.

Indeed, of the 1.95 million IBM personal computers shipped in 1985, the standard PC and Personal Computer XT outsold the AT by about five-to-one in 1985. The first half 1986 could be even worse, given the availability of inexpensive PC "clones" and various add-on products such as extended memory and speed-ups that enable standard PCs to gain performance equivalent to that of the Personal Computer AT. IBM's near-term PC problems can thus be summarized as follows:

- Declining margins on the low-end PC and XT as IBM lowers prices to meet the profusion of fully-compatible 8088/8086-based PCs selling for under \$1,000.

- Limited PC and AT differentiation due to the PC/DOS 640K byte restriction and inability to run in 80286 protected mode, crippling its sales ironically, the same problem IBM is currently facing in its 3090 mainframes.

- The 640K byte PC/DOS restriction, will also limit Netbios with Token Ring and APPC/PC connectivity programs because they will need too many resources and "kill" the PC.

Continued page 7

VIEWPOINT

* No significant new PC applications programs, like Lotus, to stimulate increased demand.

While the Intel 80386 chip and PC/DOS 5.0 will solve many of these problems and encourage new application software development, they will not be available in quantity until mid-1987. Moreover, they will be expensive — running about 15% higher than the current AT — and upgraded programs to take advantage of 80386-based machines will not be available until late 1987. IBM cannot afford to wait that long.

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*IBM must
gain control
of its PC
environment
so it is not at
the mercy of
PC clone
pricing.*

The company must fix the AT and reduce its price to fill the current XT's price slot. More important, IBM must gain control of its PC environment so that it is not at the mercy of Microsoft's lack of development or of the PC clones' pricing.

How will this be accomplished? There will be an IBM operating system aimed specifically at the 80286 and 80386 machines and a "bundled," rewritten version of Topview.

The IBM OS (a future operating system not yet announced), or IBM/DOS, would be similar in functional respects to Digital Research, Inc.'s (DRI) Concurrent PC-DOS product, which can run in the 80286's protected mode, support virtual memory and multitasking and still support many PC/DOS applications (IBM currently offers PC-DOS on a AT-based retail system it introduced a few months ago). The last point, PC/DOS compatibility, is critical because it will enable users to continue running their old applications and to take advantage of any new PC/DOS programs that become available (PC-DOS has had problems with this).

IBM/DOS would also support new versions of PC/DOS like DOS 5.0 so users could take advantage of applications written in either OS for transparent data transfer and context switching between applications in the two OSs.

While IBM/DOS would be open to encourage third-party development, it would provide a solid platform for IBM's own Phase II software products — and its destiny would be controlled by IBM.

A bundled rewritten Topview

using read-only memory chips (ROMs) or PALs and containing a graphics interface, more functionality and ease-of-use would encourage developers to take advantage of this multitasking facility. It would also solve some of Topview's resource consuming problems and enable IBM to differentiate its hardware from that of the PC clones.

Taken together, IBM/DOS and a bundled Topview would solve many of IBM's current PC

problems. They would encourage users to migrate up to more powerful machines and thus utilize Phase II software.

In addition, IBM's new hardware — a repackaged, cheaper, faster AT (AT II, likely in second quarter 1986) — and the future 80386-based machines would support these facilities with a new Bios that would make the clones' life more difficult and stabilize mid-range and high-end PC pricing. The AT II would

occupy the old XT price slot (about \$2,700 for a basic system) while the XT would be "left to the wolves" at the very low end (about \$1,000 for a basic system).

These software products are critical to IBM's future PC strategy, and introductions are expected during the next six to nine months. Other systems vendors like Digital Equipment Corp., AT&T, Wang Laboratories, Inc. and Hewlett-Packard

Co. will likely adopt a similar PC strategy — a proprietary operating environment that supports PC/DOS as a "subsystem" — to encourage synergistic attachment to their minicomputers.

Kutnick is an independent consultant based in Weyland, Mass., specializing in strategic planning for IBM users and competitors. He was formerly executive director of the Yankee Group.



VIEWPOINT

End Users Take On New PC Tasks



ISSUES AND ANSWERS

By Robert D. Gilges

There is a trend among corporate managers to seek solutions to DP problems that they can understand and control. This often means doing with micros what was formerly done with a more remote, centralized and larger computer. Even more important than offloading mainframe applications to the micro is applying micros to tasks never before computerized or beyond the capability of larger systems. In

this regard, the micro is leading the way to applications that could have major strategic impact through competitive differentiation. For example:

- A financial planning service firm uses a micro running an expert system that allows clients to enter personal information. The computer formulates alternative financial strategies involving insurance products and securities that are then discussed with the client.

- A CPA firm offers its clients the use of a micro with tax planning software capable of computing tax liability under current law. The client enters known or estimated amounts of revenue, expenses, deductions and other financial information,

and the computer provides tax liabilities. Results are shared with the firm's tax consultants.

The dispersion of DP into the hands of end users involves more potential risks compared to centralized control of DP. The more important of these risks are:

- DP solutions may be too short-term and suboptimal. Because each unit manager views his DP tasks from his own perspective, the organization runs the risk of solutions that may be less than optimal on a companywide basis. Also, the unit manager may not have at his disposal sufficient resources to choose the micro solution that is best for him. Instead, he may settle for a short-term fix that

doesn't do the job well.

- There is a greater chance of losing security and control. Certainly one of the advantages of the old centralized form of organization is the security that is obtained when a process is performed within the confines of an enclosed space with limited access to data or programs. The new CPU dispersion and telecommunications require different approaches to data security. Undoubtedly, the solution will involve some combination of new security technology plus a dose of good old-fashioned education and internal controls.

- DP planning is performed at too low a level. It is increasingly recognized that information planning is a key element of strategic business planning. Overall objectives of an organization should consider DP and the information infrastructure from a global perspective.

Attempts to have old line "mainframes" provide advice on micro applications have not been too successful. The idiom of mainframe professionals is centralization; for the micro guru and end user, it's independence and self-sufficiency. To support this end-user movement, many organizations have created a company "computer store." This is their way of formalizing the informal micro support network in the organization. These stores are typically staffed with personnel who have learned DP on the micro.

But the computer store idea alone is not sufficient to assure that micro applications initiated by end users avoid the risks discussed above. Typically, the corporate computer store serves three functions. First, it ensures that hardware and software products used in the organization will be standardized. The store stocks and provides support on relatively few products and steers users toward only these packages and devices. Second, the computer store focuses corporate purchasing power to obtain the best price when buying hardware and software. A third purpose is to provide initial classroom training and ongoing support to end users in micro operation. The principal problem with the computer store is that it tends to deal almost exclusively with packaged productivity software, neglecting other areas that might lend themselves to micro applications.

A corporation's culture will, to a great extent, determine the organizational form it adopts for integrating micro technology into its overall DP planning and control.

Organizations should encourage the initiatives and sense of ownership that result from less inhibited end user DP. At the same time, they should exercise the necessary security controls and data coordination required to achieve organizational goals effectively. In this regard, the tug-of-war between end user autonomy and central control resembles similar struggles in other key areas of decision making within the organization. Ultimately, the successful DP organization form is one that merges best with the cultural environment and operational requirements of the enterprise.

Gilges is partner in charge, information systems services consulting, at Paul, Moranic, Mitchell & Co. in New York City. This article was written in conjunction with Harold I. Berliner, partner in charge, microcomputer consulting services, at the same company.

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VIEWPOINT

Micro Training — A Missed Opportunity



MANAGER'S CORNER

By Alan Peasey

The users' honeymoon with micros is over. Machines bought impulsively and with high hopes are now gathering dust. And we data processing managers are missing an important opportunity — saving the marriage by giving users the training they need to get their money's worth from these systems.

Why haven't formal data processing-sponsored user education programs ever

taken hold in corporations? One stumbling block has been users' attitudes toward data processing. Many users acquired PCs without seeking guidance from what they considered a didactic DP department. And while users managed to get some rudimentary lessons on running the systems, they shunned data processing training as unnecessary and undesirable. Moreover, users believed DP did not know about or endorse micro technology — often true. But there were times DP deserved more credit for its skills.

Another barrier to user education was DP's own resistance to training. "We don't have time." "That's not our job." These excuses disguised a selfish, dog-in-

the-manger attitude about disseminating technical information we considered proprietary.

Misunderstandings developed. Distrust grew. Working relationships between users and DP ultimately broke down.

As a result, new and productive use of personal computers is grinding to a halt. Companies do not just scrutinize future PC expenditures, but question past purchases as well.

The situation can improve, however. Users now realize they need help to get the promised mileage from micros. In addition, DP has grown up and is better able to work with and support users.

DP can assist the user in many ways. Standardization policies, central management programs, integration technologies and application design are just a few examples. But the best way is by offering education in several forms: basic training, techniques, computer literacy, creativity and mutual aid.

The key to effective basic training is to include more than just instructions on how to use a product. Such a program must be supplemented by education that accommodates expanding user needs.

Then, beyond just teaching how to run an application, techniques like effective backup procedures, useful file naming conventions, expansion planning and troubleshooting would make someone a better PC user. DP is experienced in these areas and can pass on this knowledge easily.

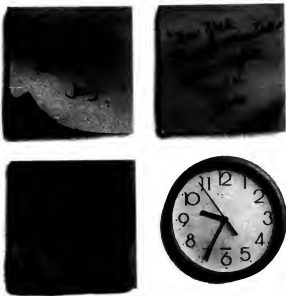
Computer literacy is also important. Learning the basics will lead to more effective use of the technology. Understanding file indexing, memory storage vs. auxiliary storage or layers of a communications protocol could enlighten a baffled user. I am not suggesting everyone acquire computer science degrees, merely an introduction to concepts, basic technology and buzzwords. You don't have to know how your car works to drive it, but a simple appreciation of auto mechanics helps you diagnose problems, provide maintenance and avoid inadvertent abuse. The same applies to personal computers. Besides, the sense of confidence this training provides will encourage fearless exploration of new capabilities.

Creativity is the most difficult training challenge because it cannot be taught. But DP over the years has developed methods and techniques for analysts to follow to create effective automated systems. If advanced PC users understood some of the basic approaches to apply to business situations, they could take a fresh look at how PCs are used, then expand and improve upon them. Concepts like problem definition, data collection, information flow analysis and data definition on the surface often are rigid and proceduralized. However, they provide an objective and methodical discipline for approaching any problem. And because it is impractical to assign high-priced analysts to small proprietary micro systems, users will have to rely on their own ingenuity.

Mutual aid refers to users cooperating to develop new ideas and not reinvent the wheel. DP's role can be to encourage this exchange of opinions through such vehicles as informal user groups, personal computer newsletters, application demonstrations, electronic bulletin boards, conferences, resource clearinghouses and so on.

Users must approach micros intelligently, confidently and creatively. This won't happen automatically. Luckily, DP is ideally positioned to change that with the resources and abilities to provide multifaceted training programs. The responsibility of companywide micro education is still waiting for an owner. It is in the interest of users — and the whole company — if DP claims it.

Young is MIS director and responsible for user technology at a major Massachusetts manufacturing firm. He has worked in the industry for 15 years.

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NEWS

Update: Recent News In The Microcomputer Market

Although the personal computer market continues to show slowed growth, attitudes are undergoing substantial changes in the user community. A willingness to "downsize" applications to take advantage of price/performance ratios and increased flexibility are on the upswing. In addition, expectations of PCs affect on the mainframe have changed radically over the last number of months. In 1985, 73% of users in an International Data Corp. (IDC) survey expected the PC to have no real effect on the mainframe; in 1986, only 34% felt that way.

While little on the hardware front has made news recently, IBM did announce its reduced instruction set computer (RISC), the Personal Computer RT. Of more widespread interest was the announcement by Compaq Computer Corp. of its 80286-based Compaq Portable II. At 23 lbs, the new computer is 30% smaller and 17% lighter than other Compaq. The Portable II can run at 6 MHz or 8 MHz, three to five times faster than 8088-based computers.

On the software side of microcomputing, Lotus Development Corp. at long last announced an upgrade, called Ver-

sion 2, to its 1-2-3 and at the same time let its users know that soon it would no longer support Version 1.1. Some users found the upgrade underwhelming and the squeeze play to upgrade infuriating. Ashton-Tate also released an upgrade to its popular data base package, called dBase III Plus. Among the enhancements in the new package was a multiuser capability for use on networks.

Philippe Kahn, Borland International, Inc.'s flamboyant president, continues to make the big news in the software industry. Borland's latest PC product, Turbo Prolog, is billed as a "fifth-generation language development system that outperforms other existing Prolog language tools by factors up to 10,000, with performance comparable to prototypes for the Japanese fifth-generation computers." But the biggest news about Turbo Prolog is its \$99.95 price tag.

Site licensing continues to be a hot subject. Unfortunately, it seems to be of more concern to corporate users than to the major vendors. Leaders Lotus and Ashton-Tate have no site licensing available and no plans on the horizon. Multimate International had a site-licensing program. However, Multimate has been acquired by Ashton-Tate, and in early March the company announced it is discontinuing its site-licensing program.

In a move hailed by some as precedent-setting and by others as in-hum, IBM and Apple Computer, Inc. have joined the

Corporation for Open Systems, a non-profit trade organization that hopes to establish a single set of interconnect standards for diverse microcomputer hardware. IBM and Apple are the two newest members of a group that includes Digital Equipment Corp.; Hewlett-Packard and Co.; Honeywell, Inc.; Convergent Technologies, Inc.; Control Data Corp.; Sperry Corp.; Tandem Computers, Inc.; National Semiconductor Corp.; and Intel Corp.

Extended Memory Standard (EMS) is expected to be the next breakthrough in the microcomputer market, spurred in large part by the preannouncement of Intel's 80386 chip. As a result, selling prices of existing 80286-based microcomputers, including IBM's Personal Computer AT, are already dropping. According to Aaron Goldberg, director of IDC's Micro Advisory Service, users can also expect 8088-based PCs to drop even further in the second and third quarter 1986, possibly to under \$500 for floppy-based IBM PC-compatibles and to under \$900 for Personal Computer XT-compatibles.

A sign of health in the microcomputer industry came from the Semiconductor Industry Association in San Jose, Calif. According to its data, the ratio of microchip orders to sales reached 110 to 100 in February, up from 104 to 100 in January. This was the sixth consecutive month that the indicator rose.

AI Gaining Speed In PC Arena

Although in 1985 many analysts were pessimistic about the Artificial Intelligence (AI) market, one year later the AI industry is surging ahead.

In the hardware arena, systems based on 32-bit microprocessors and the LISP AI language climbed from \$100 million in U.S. revenues in 1984 to \$172 million in 1985, according to International Data Corp. (IDC), a Framingham, Mass., market research firm. IDC estimated this market to reach \$252 million in 1986. The AI software market, has stratified into three major components: AI programming languages, expert systems tools and natural language processing.

Using natural language (AI) interfaces to such things as relational data bases and spreadsheets. At the higher end, AI techniques are being used in the development of expert or knowledge-based systems that are tied to the new breed of 32-bit micros and the so-called LISP machines. Xerox Artificial Intelligence Systems has introduced the 1185 and 1186, two workstations designed for developing and running LISP programs, and also the 11-9-105T AI workstation, which Xerox said will enable users to configure an AI information processing installation.

Along with technical systems from Hewlett-Packard Co. and Data General

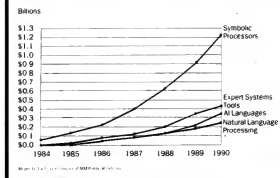


Figure 1. AI Vendor Revenue Growth

Artificial Intelligence Markets (AIM), a Natick, Mass., research outfit, placed AI software revenues at a 5% share of a total U.S. software market of \$14 billion in 1985. In 1990, AIM estimated the AI share of the pie to reach 2.2% of a total software market of \$46 billion. The bulk of this will come from sales of expert systems and natural language interfaces. While the percentages seem small, they point to an industry on the move.

Susan Messenheimer, president of AIM, thinks new vendors may be tempted to place the AI tag on products not using true AI techniques. "The AI acronym has become another marketing buzzword. AI is in danger of becoming a convenient way to try and add some excitement and luster to what has become a dull software industry. The term artificial intelligence can now be as much a marketing ploy as a real product," Messenheimer said.

During the past year, a market has sprung up for micro software packages

Corp., Digital Equipment Corp. officially entered the AI marketplace with an AI workstation built around its computer.

Symbolics, Inc., which claims the largest current installed base of LISP-based machines, has come out with two models slated for use in developing expert systems, very large scale integration (VLSI) design, computer-aided design and engineering, language translation and speech recognition. Texas Instruments, Inc.'s Data Systems Group has upgraded its Explorer LISP processing system and LISP Machine, Inc., has introduced its Lambda OEM, a card cage integrating the company's multiprocessing bus architecture and integral Multibus.

The LISP-based workstation vendors, especially Symbolics, have the lion's share of the microprocessor AI workstation market, according to Messenheimer, because they are the more experienced. But that market is predicted to get crowded with new vendors.

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NEWS

CD-ROM Conference Forecasts Growth, Standards

Though no products were introduced at the recent ballyhooed First International Conference on CD-ROM (compact disk read-only memory) in Seattle, Wash., the event is being perceived at the least as an important meeting of the minds of some of the potential heavyweights in the nascent CD-ROM industry. At the meeting, besides the sponsor Microsoft Corp., were representatives from Digital Equipment Corp. and Apple Computer, Inc., the three of which form the base of the High Sierra Group, an organization whose aim is to establish a file format standard for data stored on CD-ROM disks. Also at the meeting were representatives from Sony Corp. and Philips N.V.

of the Netherlands, who happened to put forth their own proposed format standard called Compact Disk-Interface (CD-I). With the lack of products, much of the focus on CD-ROM has turned to the standards issue. The High Sierra standard only applies to text, however, while the CD-I standard is more ambitious, covering text, graphics and sound. Though the two standards are incompatible, John Einberger, director of software development for Reference Technology, Inc., Boulder, Colo., and chairman of the High Sierra Group, said the group would probably have to revise its current standards draft to coordinate its format with the graphics and sound functions in the CD-I

format.

Against this standards background, CD-ROM vendors are tentatively coming forward with some products. Microsoft has shown a prototype multimedia encyclopedia on CD-ROM that combines text, still images, animation and stereo sound.

Other products in the works include an IBM Personal Computer/CD-ROM interface from Intergraph Software Research, Inc., Chicago, that enables users to call up magazine and newspaper articles based on date, location and topic. Equatorial Communications of Mountain View, Calif., has come out with a prototype system aimed at allowing publishers to distribute archival data on CD-ROM



Kiddall, president, KnowledgeSet Corp.

disks and updates by satellite.

"The CD-ROM market is going about as fast as it can," explained Julie Schwerin, president of Infotech, a Pittsfield, Vt., research company. "At this stage there are about 40 products, some on the market, most still being developed. The brunt of the applications will be for library automation, general reference, science and technology and business."

"The bottom line, if people are going to use this [CD-ROM] technology, is applications and cost savings. CD-ROM will be more cost-effective than the current data base retrieval services because the CD-ROM data bases can be purchased outright [instead of rented, as with commercial data base services]. The throughput rate from CD-ROM disk to computer is also much faster than over the telephone wires. There is much more space for users to do some menu-driven, real-time applications at the high speed the CD-ROM data comes in," Schwerin said.

A company gaining a high CD-ROM profile is KnowledgeSet Corp. of Monterey, Calif., in large part because of the high profile of its president, Gary Kiddall, founder of both Digital Research, Inc. and the pioneering CP/M micro operating system. KnowledgeSet is about to offer a CD-ROM-based encyclopedia data base, with plans to expand into visual as well as textual information. The key to CD-ROM, explained Kiddall, is in giving users the ability to explore and create new applications within the data bases, not just in providing data.

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CIRCLE READER SERVICE NUMBER 132

Zenith Is Winner

In a long expected move, the Internal Revenue Service chose a vendor to supply its agents with laptop micros. What was surely not expected was the vendor chosen: Zenith Data Systems Corp. was chosen over a slew of contending heavyweights, including IBM, to supply more than 15,000 portable micros, a contract that means \$27 million to Zenith.

The micro chosen, the Z-171 PC, was originally manufactured and sold as the Pivot II by San Leandro, Calif.-based Morrow Designs, Inc. The IRS machine specifications include a backlit liquid crystal display, 512K bytes of random access memory, internal modems and two 5¼-in. floppy disk drives. In addition to the hardware, the contract includes service and software.

In an interesting aside, last year Zenith bought from Morrow for \$1.2 million the license to manufacture and sell the Pivot II. In early March, Morrow filed for protection under Chapter 11 of the federal bankruptcy code. Morrow has reported debts of approximately \$5 million, and during the past two years the company has suffered losses of \$6 million.

LAPTOP ANALYSIS

Is the Laptop Market On Hold?



The laptop market seems always out of reach. What's needed is an understanding of what users want and will pay for and the relationship between desktop and laptop.

• B Y • A M Y • D • W O H L •

The laptop market could often be compared to the water held in the dike by the Dutch boy's finger. Many analysts believed the event that would open the floodgates would be IBM's announcement of a laptop computer, precipitated by a desire to meet the procurement requirements of the Internal Revenue Service laptop bid for field auditors.

But once again, IBM has shown that gossip about its product announcements — even respectable guesses in publications like *The Wall Street Journal* — are no proof at all that the Big Blue giant is about to pounce. The reality is that big companies need products that address big markets — or the products may not get announced at all.

In the case of the laptop market, industry gurus came up with three theories. First, they expected IBM to announce a laptop computer (code-named Clam Shell). Second, they were certain IBM's new product would win the giant IRS bid for 15,000 portable computers.

Third, they were absolutely convinced that if IBM entered the yet unexciting (another word for relatively low volume) laptop market, it would move explosively forward, making yet another fortune and creating opportunities for a dozen smaller success stories. (Clearly, the industry had forgotten such IBM nonsuccesses as PCjr and the Portable PC).

But IBM lost the IRS contract to Zenith Data Systems Corp. and apparently decided that without the pressure of the IRS rules, there was no need to announce a laptop at that time.

Now, what is a laptop? Definitions vary. For reference, let's differentiate among desktops, portables and laptops.

A desktop is a PC that stays at home (that is, in the office). It weighs a lot (substantially over 30 lbs., plus printer), needs to be plugged in and is not designed to be packed and carried safely or easily.

A portable or transportable is designed to be moved, but it still weighs a lot (typically 25 lbs to 30 lbs., plus printer) and needs an

electrical outlet. Ergonomics, particularly screen size and positioning flexibility, may be compromised for size and weight.

A laptop is a little portable, theoretically small and self-contained enough so you can literally sit in a plane, train or car and use it in your lap. Most laptops, however, spend considerable time being used on a desk or table in a hotel or someone else's office. This leads you to wonder why laptops must be battery-operated, and, therefore, have lousy screens — or be usable for only an hour or so on the battery.

Another problem is the need to augment the heavy battery pack with a heavy charger/AC converter for plug-in usage. I think I'd like to see the AC-powered version become standard, with battery operation optional. And could the power cord pull out from a self-retracting reel like the cords on my \$150 vacuum cleaner and \$20 can opener?

A laptop generally weighs less than 12 lbs., including batteries and screen, but usually not a printer. It generally measures 12

by 15 by 3 in., a size that would fit in a briefcase, but most users carry laptops separately, usually in a shoulder case designed to handle the weight — the shoulder can bear more than arm and hand alone — and to store all those weighty accessories.

The last time I took my Data General Corp. DG/One on the road for a week, for example, I needed to include:

- The DG/One.
- Its printer.
- A 5¼-in. disk drive.
- A recharger.
- A power cord.
- An extension cord.
- A 3-to-2 plug.
- A clamp-on high intensity lamp (the better to see it with).
- A spare battery pack.
- Software.
- Extra diskettes.
- Extra thermal ribbons.

I needed an oversized briefcase and a folding cart to get it to the plane. Laptop, ha!

With all that bulk, it's no wonder that some hotel room PC users throw in a (virtual) sponge and put their Compaq Computer Corp.'s

LAPTOP ANALYSIS

Compaq (now down to 23 lbs in its newest version) onto their folding cart instead.

Laptops are scarcely a new product. From the lovely but expensive Grid Systems Corp. Grid to the tiny, inexpensive (but scarcely powerful) Tandy Comp. TRS-80/100, we have seen lots of laptops come and go. In fact, my favorite laptop is one that went — the ill-fated Convergent Technologies, Inc.'s Workslate.

This tiny but nearly terrific, 3-lb machine certainly met my size and weight desires. Unfortunately, it functioned on a whimsical schedule that rarely coincided with mine. And more importantly, it assumed that traveling professionals think mainly in terms of numbers and spreadsheets and, therefore, it offered flimsy support for users who think primarily in words.

In any event, it quickly disappeared from the market, done in by deficiencies in functionality, maintainability and distribution channel. Convergent Technologies has traditionally sold through indirect, original equipment manufacturer channels while the Workslate was intended as a direct market — including consumer catalog — product.

Why aren't laptops taking off? For one thing, laptop users don't buy laptops instead of a computer for their office. Instead, they buy them to supplement an existing system, often after they've grown accustomed — even addicted — to their computer-based working environment. This is important because it means systems with dreadful screens — even those that can plug into a better screen at home or in the office — may not sell well because chances are potential buyers already have better systems in place at their living or working quarters.

Secondly, laptops need to be relatively compatible with a competing — often IBM and compatible — environment in the work place. Contrary to what some laptop designers claim, it is unlikely that users want to run two entirely separate computing environments, one on the lap and one at the office. In fact, users strive to make the seam between their various computing environments as invisible as possible.

Never mind the 3-page recipe I got for shipping a partially formatted TRS-80/100 file to a Macintosh, complete with illicitly used cables and secret commands. Suffice it to say that any laptop that produces a result that must be rekeyed into your regular computing environment isn't necessarily very useful.

Compatibility isn't just an operating system issue. In order to be smaller and lighter, many laptops employ 3½-in. diskettes. Unfortunately, most PC software is copy protected on 5¼-in. diskettes; thus, it is hard to get all the packages to port over to the laptop environment.

Laptops need to do serious computing: only devoted computer users are willing to invest the required effort and money to carry them around — and these users want to work with high-end packages such as Lotus Development Corp.'s 1-2-3, Ashton-Tate's dBase III and sophisticated word processors. This means 512K bytes or 640K bytes of memory and two diskette drives, or a diskette plus a hard disk (a configuration that will predominate in 1986 now that 3½-in. 10M-byte drives are becoming available).

"

Contrary to what some laptop designers claim, it is unlikely that users want to run two separate computing environments, one on the lap and one at the office. Users strive to make the seam between their computing environments as invisible as possible.

Many laptops can be so configured, but only at prices hovering at \$4,000 and up, far more than users want to pay. And a number of older (or cheaper) laptops don't have removable storage, a serious

limitation for noncasual, on-the-road computing. These machines are mainly for taking notes and making decisions while traveling — not for supporting the user with multiple machines.

Another dilemma for the laptop user is the limited ability to see what is entered and processed. Computer users expect the laptop to offer normal capacity — that is 25 80-char lines — and reasonable viewability. Unfortunately, many display problems have plagued laptop screens. They have been limited to four, eight or 16 40-char lines; are capable of displaying uppercase characters only or barely readable fonts; and cannot tilt to the best angle for viewing or handling ambient light.

Some of these problems have been solved through larger and higher resolution screens, better font design, improved packaging and enhanced LCD that uses an electroluminescent technology to backlight the display as in the Sharp Associates, Morrow Design, Inc. and newly triumphant Zenith laptops.

Catch Forte's new



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LAPTOP ANALYSIS

77

Portables get slung into the overhead rack, checked as baggage or left at the airport club while their owners run a last-minute errand. Thus, expensive portables become a clear liability — it's hard to carry them around and expensive to leave them lying about.

A continuing problem has been screens that are too small. Potential cues lie in the new flat screen technologies and in more compact electronics that leaves more room for the screen.

Another factor inhibiting the growth of laptops is price. The fact of the matter is, if laptops were cheaper, users would buy more of them. When thinking about purchasing a second or third machine, the buyer looks at incremental value and might want to spend less though not scrimp on functionality. Therefore, the cheapest model won't necessarily clinch the sale.

Moreover, portables get slung into the overhead rack, packed and checked as baggage and left at the airport club while their owners run a last-minute errand.

This means that very expensive portables become a clear liability — it's hard to carry them around and dangerously expensive to be careless with them and leave them lying about.

In addition, a portable computer looks like an affluent consumer item rather than a serious business tool. Therefore, users expect a more consumerlike price tag, forgetting that volume keeps com-

sumer pricing down.

And those little screens, clackety keyboards and inconvenient features make portables look less valuable (and harder to use).

There are some features that could fire up the laptop market. Here is the ideal laptop, the one users would pay cash on the barrelhead for:

- Size: 9 by 12 by 1 1/2 in. (small enough to be carried in a briefcase).
- Weight: Not more than 5 lbs.
- Screen: 25 lines by 80 chars and highly readable (today, backlit LCD; tomorrow, gas plasma or flat CRT).
- Memory: 512K bytes or 640K bytes standard.
- Auxiliary Storage: 3 1/2-in. drives (2 diskettes, optional 1 diskette plus hard disk).

- Keyboard: full-size, standard.
- Processor: 8088, 80186 or 80286, with 8087 family coprocessors as an extra-price option (and 68000-based Macintosh compatibles, too).
- Printer: Optional, near letter-quality. (Please don't build it in; who needs the extra weight and size).
- Software: Fully MS-DOS compatible with standard or optional graphics support.

- Communications: Built-in modem (1200 bit/sec minimum) with jack and optional acoustic coupler. User-friendly interface for normal communications support. Must be extremely easy to transfer programs and files from laptop to desktop.

- Price: A reasonable configuration (certainly with at least 512K bytes and dual diskettes) for around \$2,000. Rich configurations should cost \$3,000. Note that there might be a market for a more luxurious product (with special display and/or packaging) at a higher price.

Believe it or not, the IRS selection of the Zenith laptop may represent simply an unusual instance of national behavior. While identical to the Morrow laptop, the Zenith machine is a superior product, offering a hefty, 15-lb workstation that is fully functional — with two 5 1/4-in. drives, battery or AC operation and a very readable 25-line backlit LCD display.

The standard Zenith laptop is completely IBM-compatible, can support an optional RGB or composite monochrome monitor, offers up to 640K bytes of memory (256K bytes is standard) and supports an optional 300/120-bit/sec modem. Except for its substantial weight, this Zenith product should remind you of a lot of the laptop fantasy we described above.

In fact, it may be Zenith and not IBM that opens the door for laptop marketers. If the IRS is pleased with its new acquisitions, the use of small systems in the field will flourish, swelling the market and fueling lots of new product design and technology investment.

There is a market for laptop computers, but a poor understanding of what users want and will pay and of the relationship between the desktop and laptop worlds.

It is likely that attractive products addressing these needs will wind their way to market and that the demand for laptops will grow, perhaps explosively, during the latter half of the '80s.

Wahl is president of Wahl Associates, an office automation consulting firm in Bala Cynwyd, Pa., and editor of The Wahl Report on end-user computing.

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SUPERMICRO UPDATE

Say Hello To 32 Bit Processors

• BY • STAN • KOLODZIEJ •

The announcement of the 80386 32-bit microprocessor by Intel Corp. of Santa Clara, Calif., in late 1985 is shaping up as a major advance in future personal computer development and in office computing.

To begin with, the fact that the microprocessor is from Intel is significant. IBM has all but declared it will incorporate the 80386 into a new line of office PCs, which it will introduce sometime in 1986 or early 1987. It might even be sooner because Intel has hinted to the press that the 80386 will probably be available in quantity sooner than expected. Besides IBM, a raft of other computer vendors including Wang Laboratories, Inc., Compaq Computer Corp. and Convergent Technologies, Inc. have come forward with early promises to produce 80386-based units.

IBM's commitment to the new Intel microprocessor promises finally to produce an office microcomputer system that will break the growing performance constraints of the Intel 8088- and 80286-based microcomputers. IBM's marketing clout will provide a quantum leap in single and multiple user office computing and compel software vendors to create major extensions to the



current MS-DOS/PC-DOS operating systems.

Just as importantly, it will also provide a major alternative to those users unhappy with many of the Unix-based 32-bit departmental systems currently on the market, which more than balance their superiority in speed and memory with lack of good, user-oriented software.

Intel's 80386 processor is important for the technology it will

bring to the table as much as the marketing muscle behind IBM's name.

The 80386 has been designed for high performance and multitasking operating systems. In addition, the 80386 can handle the simultaneous running of multiple operating systems. Object code compatibility means that the new processor will be able to emulate and run the enormous base of MS-DOS programs developed over the

years for 8088 and 80286 microcomputer systems, at two to three times the speed of the current 8088 machines.

Though it will be able to run some Unix applications concurrently, the 80386 will no doubt help push Unix further from office computing into the scientific applications corner, leaving extended, multitasking MS-DOS software firmly in the office driver's seat, at the 32-bit high end. (Though IBM's recently introduced Reduced Instruction Set Computer (RISC) engineering workstations support the Unix operating system, the 32-bit RISC processor used is based on proprietary architecture. IBM has also been ambivalent about its position on RISC's future in the office.)

The Intel 80386 will impact other areas of an office systems market currently in flux at the departmental, end-user level. One of the prime targets will be the supermicro market, already in a state of steady decline since its heyday in the early 1980s.

Despite price erosion in memory chips and processor components, 32-bit supermicros are still relatively overpriced, generally in the \$15,000 to \$30,000 range, and have experienced trouble fitting into the recent trend toward the

SUPERMICRO UPDATE

integration of systems both within and outside corporate departments.

Many supermicro vendors also got hurt by hanging their software hats on either Unix or some proprietary operating system (run on 32-bit Motorola Corp. 68000 microprocessors) in the days when both options seemed legitimate. The result has been confusion in developing efficient links between the supermicros, local-area networks and MS-DOS-based microcomputers. Of the lot, it appears that only Altos Computer Systems, Inc. and Tandy Corp. have been able to buck the supermicro slide.

Other companies that built departmental systems around lesser known off-the-shelf 32-bit microprocessors such as

National Semiconductor Corp.'s 32000 series and Zilog Inc.'s Z8000 have been burned in the office and found refuge in niche applications such as on-line transaction processing and in multiprocessor systems aimed at scientific applications, both outside the mainstream of office computing.

Adding to the woes of the supermicro computing vendors are the new aggressive marketing strategies of traditional 32-bit minicomputer companies. These companies are shaking the market with powerful, low-end, 32-bit machines that are being used as hosts and file servers in small departmental workstation clusters, plugged into the company's broader networking schemes.

Digital Equipment Corp. of Maynard, Mass., and Data General Corp. of Westboro, Mass., are two of the traditional

minicomputer vendors now capable of offering such one-stop shopping all the way from the single user to corporate-wide computing.

"Supermicros and other departmental computers are being pushed into a corner from above through aggressive marketing and product expansion by companies like DEC, DG and now IBM with its IBM 36 Personal Computer," said Ornel Serin, president of ITOM International Co., a market research company in Los Altos, Calif. "Their previous ability to survive because of lack of pressure from below is now in jeopardy. The 80386-based machines will provide pressure not only with their 32-bit technology but also from the powerful business software applications they will pull up with them."

Under this kind of pressure, Unix and the office are quickly becoming as com-

patible as oil and water. Along with those office computing companies that based their office systems on Unix, Motorola is bound to suffer, its 68000 series having become synonymous with the Unix operating system. To a large extent, the failure of Unix in the office is also Motorola's failure.

Vendors of Unix-based office systems are now busy scrambling to link their Unix programs with MS-DOS software. A subindustry of third-party companies providing protocol and translators for such data conversion between operating system formats has sprung up in the past year, especially when it became increasingly evident that no single de facto Unix standard would emerge in the near future and the number of predicted at least by Unix supporters) good Unix business programs fell far short of expectations. Users have stayed away from Unix in droves.

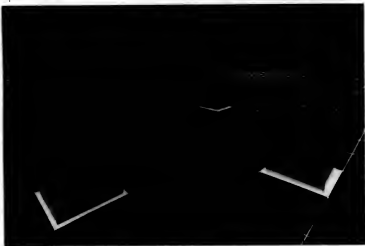
"At a recent Uniform show," explained Marty Gruhn, vice-president of The Sierra Group in Tempe, Ariz., "the entire emphasis was on getting MS-DOS capability on Unix-based workstations. Just a year ago, Unix vendors were presenting Unix as an either/or situation in the office. Either you go with us or with MS-DOS. Users replied by staying with MS-DOS. Unix vendors have seen the light and that's to live with MS-DOS or not at all."

Though Unix is tied closely to the Motorola 68000 series of microprocessors, it is not married to them. Several companies such as NCR Corp., AT&T and Hewlett-Packard Co. have had the resources to produce successful Unix-based systems employing their own proprietary microprocessors.

DEC has come out firing with its Microvax II system and is doing damage in the low-end of the 32-bit office market while AT&T's 386 series of computers has proven one of the only AT&T successes in an otherwise dismal computer showing so far.

It's those companies such as Fortune Systems Corp.; Plexus Computer, Inc.; Convergent Technologies; Cromemco, Inc.; Alpha Micro, Inc.; and others that rely on the off-the-shelf Motorola 68000s, however, that are in a dilemma. Lacking good third-party Unix business software, these companies carry neither the market clout or user base to warrant third-party software developers to write for their specific users nor the resources to develop their own in-house Unix software, despite Sperry Corp. or NCR can abide.

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complicated shell structure of Unix is about as easy as face-lifting Mount Rushmore, or gradually explore branching out from the office into the scientific/engineering and computer-aided design and manufacturing (CAD/CAM) markets where Unix is saluted, markets are booming and competition has yet to reach the saturation point. Fortune Systems and Convergent Technologies are two companies that have branched out into this latter area.

"If HP can get their RISC-based [3000 series] office machines to the market when they say they will," explained Louis Rose, assistant editor/analyst, data processing group, Dataparc Research Corp., Defran, N.J., "they will do some damage in the 32-bit office systems market outside their own user base."

Motorola, however, does have a small ace up its sleeve. With the proven track record of its 68000 series of processors combined with their decline in price, they are being incorporated into powerful, single-user machines aimed at the small business and home markets. The 68000 processor is used in Apple Computer, Inc.'s successful Macintosh computer and more recently the Amiga from Commodore Business Machines, Inc. and the 520ST from Atari, Inc. Both the Amiga and 520ST are priced under \$1,500 and are selling briskly, regarded favorably by small businesses that appreciate the power and low price tags.

If the home computer market picks up, Motorola could be well-positioned a few years down the line as a big supplier of microprocessors to the home and small business market as well as the scientific/technical/engineering workstation markets, a position it will probably strengthen with the appearance of its 68030 chip.

As for the Intel/MS-DOS market, huge though it is, there is an inherent limitation that software encounters in the 640K-byte ceiling of 80286-based systems such as the IBM Personal Computer AT and compatibles. Much of the current software applications using relational data bases and incorporating some artificial intelligence features are eating up more machine memory and nudging up against the 640K-byte limit.

The result is a paradox of the marketplace. To survive in a saturated PC software market, new vendors have to offer products with something special, and that something special is tied to artificial intelligence techniques, the wave of the future. These new programs also require more memory and machine resources than the 8088 and 80286-based machines can provide.

Though software vendors are looking for bigger machines to run their software, they are unwilling to leave the MS-DOS fold because of the established user base. As long as the Intel-based machines continue to sell, PC hardware vendors will be reluctant to introduce more powerful and expensive machines without an array of supporting software available. Users are also becoming a hard-bitten lot, not willing to jump before they've looked hard and long.

Most users are still trying to sort out the large numbers of software packages and micro systems that were purchased in the palmy days of office microcomputing a few years back. If anything, their minds are more on integrating (and rationalizing) all these separate systems through some of the newer network op-

tions available rather than introducing faster, more powerful PCs.

Even with this performance straight-jacket, software vendors such as Javelin Software Corp. and Symantec Corp. have introduced MS-DOS-based products using artificial intelligence techniques that operate cleverly within the present MS-DOS/Intel performance confines.

An attempt to expand the limitations of the 640K-byte, DOS 3.0 barrier with a technique called Expanded Memory Standard (EMS) is also underway. Three groups composed of computer hardware and software vendors are working separately to create their own EMS versions: AST Research, Inc./Quadrant Corp.; IBM (with Topview); and Lotus Development Corp./Intel/ Micro-

soft Corp. EMS relies on a sort of memory shell game, fooling the processor into thinking it has more memory by quickly switching back and forth among memory banks once a bank's capacity is reached. Basically, it allows applications to use memory beyond the built-in limits of the machine's processor and operating system.

The EMS projects are important attempts to expand the parameters of the PC software industry and increase the playing room of new vendors in what has become a flagging and congested PC software market, increasingly prone to failures and consolidation. Whether it will succeed is questioned, but even in failure, EMS could play a vital part in forming a bridge over which software developers can place increasingly powerful MS-DOS applications before the 80386

machines begin appearing. What they are developing is the means for software vendors to produce the kind of software that could take fuller advantage of the new power and speed of the 80386-based PCs.

"EMS is going to provide big business for the add-on [memory] board companies, and they in turn will push software vendors to create programs to take advantage of the added memory," Jim Weber, consultant at PA Computers and Telecommunications, Princeton, N.J., explained.

"There'll still be plenty of room to work within MS-DOS until the next generation of [80386-based] computers arrive to provide built-in speed," he said. □

Kolodziej is a senior writer at Computerworld Focus.

"While Symphony and Framework approach the functionality of Open Access, neither delivers the full punch"

Kenneth M. Landon
Wang Solutions

OPEN ACCESS
Comparison Chart

	Database	Form Query	Report Generator	Query Processor	Relational Database	Graphics	3-D Graphics	Spreadsheets	Goal Seeking	Word Processor	Communications	Time Management	Price
Lotus 1-2-3	✓				✓	✓							495 ⁰⁰
Symphony	✓	✓			✓			✓	✓				695 ⁰⁰
Framework	✓	✓			✓			✓					695 ⁰⁰
Open Access	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	395 ^{00*}

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MARKET ANALYSIS

Will A New Day Dawn For The

Many personal computer users and industry analysts remember 1985 as the year of the debacle. Major vendors left the business, reorganized or faded to mere shadows of their former glory.

The embattled competitors have now reached the Holy Grail of 1986, the year everything is supposed to get better. It's sad to say, however, that all of this confidence in a rebound is poorly placed.

The good news is 1986 will show an increase in number of units sold. International Data Corp., a Framingham, Mass.-based market research firm, expects shipments of personal computers to grow 13% in the business market, up from last year's dismal 11%. But now for the bad news: A number of factors running in the consumer's favor do not bode well for the manufacturer.

First and foremost is pricing. This year prices of old and new models of PCs will plummet. Already a large number of Fortune 500 companies are investigating and buying systems like Leading Edge Products, Inc.'s Model D and Tandy Corp.'s 1000/1200. Interest in these economical systems is expected to heat up, even over competitive machines that surpass them in price/performance.

The popularity of low cost computers will greatly impact manufacturers that, after suffering from the unit demand decline during 1985, will now have to offset a shrinking average selling price. As a result, users should not be surprised to see sales representatives pushing completely bundled systems.

Initially, the products likely to

• BY AARON C. GOLDBERG •

experience the sharpest price cuts will be the older 8088-based systems. Some of the cheaper mail order compatibles are expected to tally in at the \$500 level by September. In fact, there were advertisements in February for a build-it-yourself PC-compatible for \$499.

In the same month, IBM cut the dealer price of its dual-drive Personal Computer by 20%. Such a move indicates IBM is also feeling pressure from the less expensive compatibles and is trying to help dealers make margin on low-end PCs where there was none previously. Considering the Personal Computer XT now leads other IBM models in units shipped, this promotion may also signal the end of the old standard 5-slot PC.

Manufacturers as a group would like nothing better than for users to upgrade to Personal Computer AT-type (80286-based) systems. Yet users and other decision makers are well aware that the PC can do virtually anything an AT can do for one third the cost. By discounting the original PC, IBM can prime the market to upgrade to the AT not out of technical need or merit, but fear of obsolescence.

However, such a strategy could backfire, curtailing IBM's share of the PC market and opening up its accounts to the competition. IBM, aware of this risk, may use the PC as a test vehicle. And if Big Blue does kill the PC, the demise will not be a reflection on the utility of the system.

As for the AT product line, a price cut is due. The AT debuted in September 1984, and as typical of all IBM products, should receive

its first price reduction approximately 18 months from the date of introduction. So if I were planning to purchase ATs, I'd wait before committing to a large order.

Such a reduction also makes sense because by narrowing the price gap between the AT and 8088-based products, IBM knows it could sell a lot more ATs. The company will probably make its move when it introduces the next member of the AT family. There is growing speculation that the new machine will include a faster microprocessor (8 MHz or even 10 MHz), larger disk drive (up to 100M bytes), standard Enhanced Graphics Adapter (EGA) and 1M byte of memory.

This product is expected to bow sometime in June, perhaps concurrently with the next version of PC-DOS, to take advantage of new operating system features.

With the introduction of this new high-end product, it is likely IBM would drop the unit price of an established AT floppy-based system to around \$2,500 and bring in the hard disk version at about \$1,000 more. Considering the mail-order AT compatibles already cost \$1,995, IBM will be forced to act in this market as well.

Besides price, a second key issue facing the MIS professional in 1986 is the integration of personal computers into mainstream data processing. The focus of this integration is shifting away from the power user and toward the typical PC user who knows far less about computers and their operations. As a result, the tasks are changing from merely providing a physical connection and the necessary user

passwords to developing ways of integrating data from one environment (generally the host) to the personal computer application product. It is important to understand that this mission truly does require all the layers typically contained in the International Standards Organization (ISO) model. The user will be looking for increased usefulness of personal computer applications through use of information that was not generated by the personal computer.

Such an interaction will eventually displace host cycles with personal computer power. Personal computers will connect to hosts less as terminal emulators and more for downloading data. As a result, more of the future application set will reside on computers chosen by either end users themselves or an end-user department — the first signs of choosing the smallest computer for the job.

What changes will 1986 herald for the typical user? Some exciting products will flower and bloom this year. For a change, designers have focused on end-user utility and not gee-whiz technology.

One of the most useful of these products coming into the mainstream is the Extended Memory Standard (EMS). EMS allows the end user to surpass the 640K-byte memory limitation of DOS. Moreover, if the specification is coupled with the right software, users gain the flexibility of real multitasking without changing hardware.

Multitasking means multiple applications can run simultaneously. As a result, users will no longer need to exit a program, reboot and swap diskettes to change applications.

One of the problems with EMS is that two conflicting hardware

PC Market?

standards exist — one from AST Research, Inc., and the other a joint effort by Lotus Development Corp., Intel Corp. and Microsoft Corp. (LIM). Both are fine products, but AST Research provides a superset of the LIM standard that might have fewer closed doors in the future.

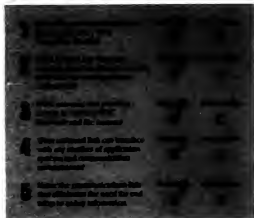
Users evaluating the two stan-

dards should focus on software, not hardware. Due to some of the alliances and competitions involved, LIM is focusing on Microsoft's Windows as the primary agent for multiple application access, while AST Research is using Desq View. At the present time, I believe there is no comparison between Windows and Desq View.

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One advantage of Desq View is that it allows most popular applications to run without modification in multitasking mode. Windows requires that the applications be "Windows-aware," which few are. If you don't think this is a big issue, consider that after all of the problems with the present Lotus 1-2-3 upgrade program, it will have to be written again for a Windows version.

Desq View also surpasses Windows in performance. Running Desq View on a standard PC causes little system degradation; with Windows, there is a noticeable decline. In addition, optimal use of Windows is hard to achieve without a mouse.

Nevertheless, Microsoft is making a lot of noise about bundling Windows into DOS — a potential problem for the installed base of 3 million-plus 8088-based systems and 10 million application products. While Windows and the 80286-based systems might get along, clearly Microsoft is pushing a product with glaring weaknesses that we may just have to live with.

Other new application products are in the offing that apply artificial intelligence techniques to allow for more intuitive use of the computer and easier learning on top of that. One of the great headaches for any organization has always been the task of training end users to operate new software packages. The products that are simple to learn, yet truly useful — like Q&A from Symantec Corp. and the PPS line from Software Publishing Corp. — will prosper in 1986. The corporate customer must finally realize that standardizing on one product is not listening to the user. Some users will need power and others will require simplicity. Contrary to popular belief, there is no single product that does both. Even Ashton-Tate has realized this and will release a low-end data base named Black Gold to complement Dbase II and III.

On the spreadsheet front, it looks like Lotus might be in for some competition. Javelin (a 1985 Software Publishing introduction) is certainly a contender. Armed with advanced analytical capabilities catering to the advanced 1-2-3 user, Javelin could gain market share. The other factor working in Javelin's favor is the tremendous level of ill will Lotus continually generates with its user-be-damned trade-in and upgrade policies.

A hot new application for this year is presentation graphics. One new product, Harvard Presentation Graphics (from Software Publishing that acquired Harvard Software, Inc.) is the first fast, easy-to-use package for not only creating presentation quality graphics but also producing first-rate hard copy to distribute to the audience.

Besides examining trends in software, it is useful to predict how the major personal computer manufacturers will fare against IBM in 1986. The primary players are Compaq Computer Corp.; Tandy; Commodore Business Machines, Inc.; AT&T; and Apple Computer, Inc.

Compaq Computer is clearly the alternative to IBM for most large- and medium-size firms. Compaq Computer's ability to innovate within the PC standard clearly sets it apart from the competition; the loyalty of its dealers is legendary. Compaq Computer will not likely bring out a lap top any time soon, but its new Portable II will undoubtedly enjoy success.

As long as Compaq Computer remains

the choice of the discriminating personal computer user, the company will maintain its lofty position and increase its market presence.

For those doubting Thomases who are wondering how I dare include Tandy in this analysis, go pound on a Model 3000. Ever since Tandy has made a major effort in the PC/MS-DOS market, the company has delivered some good products at useful prices. Tandy's service, support and distribution ranks among the very best. Yes, the company's image needs improvement, but don't overlook good products from a very stable company just because Chet/Day isn't doing their advertising. Tandy's strength is in small business, but don't be surprised if more Tandy products start creeping into corporate America in 1986.

OK, Commodore Business Machines is more concerned with the home than business, but the company is fun to watch. It is the computer company run by the "other" Pepsi executive, but enjoys nowhere near the success of Apple Computer.

Commodore's big play in the U.S. is the Amiga. Unfortunately, the machine offers snappy technology that is of little use to the customer. Applications are few, the price is high and the dealers that sell the system are not of the highest caliber. The banks have mercifully restructured some debt, and the company hopes to be profitable this year, but Commodore will most likely concentrate on its profitable European operations and decline in U.S. position.

As for AT&T, the behemoth has arrived bearing gifts from Olivetti (the 6300 is designed and built by Olivetti). The company has done a fairly good job getting market share and recognition in the PC sector. However, AT&T faces significant price cuts in 8088-type PCs without an outstanding 80286-based system to offer. The 6300 Plus cannot compete with products from Compaq Computer, Tandy or Hewlett-Packard Co.

This will be a watershed year for the company; it must continue to increase share or risk losing the momentum so painfully gained in 1985. Although AT&T will not lose ground, the company's gains are likely to be small.

1986 is the year that Apple Computer has to put up or shut up in the business PC market. The company has had two years to straighten out the Macintosh, its year to reorganize and too long to get its data communications act into shape. I think Apple Computer will show enough of the new business approach to rate another look, but business will show more interest in the MS-DOS facility that will be introduced on the Apple II rather than in the Mac. The Mac will remain a good machine to do newsletters on, but the past will haunt it in the general professional market.

Well, this is how 1986 looks for the personal computer market. This year certainly won't be as calamitous as 1985, and users will be able to take advantage of the changes to come. All it will require is astute observation, good planning and the ability to make the deal and act quickly while you have the hand small. □

Goldberg is director of PC and small system advisory service with International Data Corp., Framingham, Mass. He has been with IDC for six years and is responsible for all research in this area.

CORPORATE ACCOMPLISHMENTS

Micros Polish The Big Apple

Having survived its fiscal crisis, New York City found microcomputers could play an important role in better decision making and increased productivity.

• BY • LEE • WHITE •

When Ed Koch was elected mayor of the City of New York, the largest city in the U.S. was teetering on the edge of bankruptcy. Today, some nine years later, New York City is solvent. Although most would probably ascribe the turnaround to prudent business management and some would say Koch did it all, there is a cadre that believes micros may have played a small role in the present fiscal health of New York City.

While it is impossible to get a count of the number of micros in city government, tens of thousands would not be too far off the mark. And this is particularly amazing because, like most municipal governments, they were a few years behind the private sector to realize the importance of the microcomputer.

The global view of computing was foreseen in 1977 when the Mayor's Office of Computer Plans and Controls was established. "That was in line with the changing DP philosophy, when

the development of micros was beginning to explode. They were beginning to be purchased, but there were no controls. We needed to know what was coming in so we could avoid having a duplication of effort," Calvin Hewitt, computer systems manager, said.

Prior to the establishment of the Office of Computer Plans and Controls, the Central Service Computer Center was the hub of computing for the city. And as happened with most central computing facilities, problems arose.

The Central Service Computer Center is the equivalent of a major federal installation, but it also functions as a time-sharing service to a number of city agencies. "Agencies traditionally function independently. If you're going to have an independent operation to avoid bureaucratic tangles, you need to have a central resource that knows what is going on from a planning standpoint," said Calvin Hewitt.

five boroughs.

Before the micro deluge, computing power was at least manageable. About seven years ago, the micro made its first inroad in the city in the guise of dedicated stand-alone word processors. But about three years ago, micros began to make their mark. At that time, staff members in the Office of Computer Plans and Controls realized their work was cut out for them. "You had to have people really track things because while it was difficult to sneak big iron in, you could sneak microprocessors in," Green Dorsey said.

Often the micros that were brought in were not used. Such was the case in the 11,000-member Department of Sanitation. In 1984, nine PCs were brought in and installed. Of the nine, three were used for spreadsheet work by people who had some computer skills. Six months later, the



CORPORATE ACCOMPLISHMENTS

That was yesterday. Today is a different matter. About a year and a half ago, Madnani started up a unit within the Sanitation Department called management design. The primary focus of his group was computers were not to be regarded as simply a DP tool from the programmer's or technician's point of view. In order to further narrow the focus, they took a two-pronged approach to micro use. The first, Madnani explained, was that micros are critical tools for managers in terms of making decisions and judgments. The end result of computer use should be better decisions and judgments. The second focus was toward higher productivity. "If so many people are doing a task, maybe with a micro that task can be done quicker, better or with fewer people," he said.

There are now 25 PCs in the department with another 15 to be installed in the next few months, and the group's original focus has been borne out. Before micros, daily reports were not possible. The ability to collate, sort, group and print information in a readable fashion was something that brought a response not in days or weeks, but in months. A decision based on that information was usually too late to be of use or so old that accuracy was no longer guaranteed.

"Our agency is divided into bureaus and each bureau has anywhere from \$750,000 to \$14 million that has to be spent and used as a resource within that bureau. Until I set up the computer system, managers never knew how much money they had at any given time," Madnani said. With hundreds of requests to spend money each year, it

was, according to Madnani, a seat-of-the-pants judgment.

"We spent money and hoped it was there. We were poor budget managers — we either overspent or underspent," he said. As a result of the overspending, managers had their purchase requisitions thrown back at them, creating even more paperwork. In many cases, a critical component of the expense was left out while unnecessary things were bought. What Madnani provided the Sanitation Department managers was a data base management system, customized from Software Solutions, Inc.'s Database, which gave users the ability to keep track of every dollar they wanted to spend, every dollar they were allocated and the balance at any given time.

Once the goals of better management decisions were achieved, the productivity improvements followed. "When we provide the computer, we realize there are a lot of avenues open for them to improve their work, but they haven't explored these avenues because they haven't had the time. Now they are able to get their base lines worked out much quicker, giving them more time to do the things they've always wanted to do," Madnani stated.

One example he gave was the telephone call accounting system. The Sanitation Department pays about \$3 million in telephone bills each year. There are 600 accounts spread out over close to 400 locations. In the past, it was understood there would be errors in billing and more than one telephone system might be a better way to go. The use of micros has enabled the staff to monitor, analyze and understand the use and amount of expense incurred. "Because

we're in the public sector, we're very concerned that people don't misuse telephones. The system allows us to monitor certain buses. We're hoping to save about \$200,000 each year with the system," Madnani enthused. This kind of saving is particularly important because it is people's tax dollars being spent and mayoral agencies are always questioning how allocated money is being used.

An interesting point, that Madnani made was that neither he nor any of the micro users were products of a traditional DP background; indeed, some of the people he trained didn't even know how to type. Because of this, he spent a great deal of time on training, concentrating his efforts on convincing people they would not lose their jobs to computers. In addition, "people were afraid that they would be incompetent when working with the machines. First I eliminated that fear. Second, I conclusively proved to them that they would do bigger and better things with the computer, showed them that the routine work would be taken away and in its place would be more time to manage," Madnani explained.

The actual computer training was very extensive and Madnani chose to do the training on a one-to-one basis. In addition to teaching the software application, he taught the logic of the computer. "My staff and I take pains to describe in as much detail as possible the logical process by which a computer does it. It's from this detail that they start to understand that a computer's logic is very precise," he said.

In addition to the in-house micros, the Sanitation Department has 120 micros in its field offices, located in all five New York boroughs — Manhattan, Brooklyn, Staten Island, Queens and the Bronx. While none of the in-house micros have a need to communicate to the mainframe, each of the field micros is connected via dedicated phone lines to the mainframe to facilitate the primary use of these micros: communicating messages back and forth.

But mainframe communications for the office micros is moving up to the front burner because a centralized data base structure will be implemented within the next six to eight months. At that time, specialized analytical projects and other issues for planning, deployment and forecasting with centralized data will be put into place.

Madnani sees a very bright future for micros in the Sanitation Department. When he took the job less than two years ago there were fewer than 10 analysts in an 11,000-person department. Today the department has 250 analysts. Its own mainframe and

a large corps of users who are anxious to learn more. A few months ago, in order to publicize his group, Madnani notified each of the 200 managers that he would be giving a three-hour introductory seminar on how managers could use the micro as a resource. He limited the number of seminar participants to 20. In one week he got calls from 85 people and had to add three sessions.

Madnani, like his counterparts in the private sector, has

"We encourage users to be very demanding. This is their system."

— Raj Madnani

not had great success in reaching upper-level managers. He thinks this is because they have an even greater fear of the computer than their staff. But he sees that changing. "If everybody else has information at their fingertips, the senior manager will feel a little left out. They will want access, too. They will not always want to rely on judgments made by others."

Using a micro to track projects is not limited to pure management functions, though. What comes to mind first when you think of a Sanitation Department is surely garbage, and one micro in the department has played a big part in the sensible deployment of New York's garbage, according to Green Dorsey.

With a garbage output of thousands of tons each and every day, urban areas as densely populated as New York's five boroughs cannot continue to create garbage dumps without reclaiming land on which the dumps reside. This is accomplished by covering the garbage dumps with landfill, treating the gigantic mounds and putting up buildings over them. Landfill comes from excavation projects, and if the city doesn't have enough landfill of its own, it is purchased. With hard cash, Green Dorsey said, the city once bought landfill that was already its own. Once this information was out, the feeling was this better not happen again.

"Some real bright guys in the waste disposal group came up with the idea that a PC would allow them to put together PERT charts for every excavation project in the city. Each phase of the project would be put on a schedule. At various times they would go out and identify what

was being excavated. If we had a need for it, we'd get first dibs on it," Green Dorsey said. They got their micro, with a printer and plotter, for less than \$8,000. The savings: \$300,000 every year.

Although Hewitt in the Mayor's Office of Computer Plans and Control said that generally municipalities are a step behind state of the art, he sees New York as being "miles ahead of everybody else." Hewitt, who was hired by the City of New York from the private sector, said that New York knew it was behind the times from an automation standpoint. "Once the city saw it was about to step into the automated age, they found most people were rooted in ac, counting machines and weren't aware. The fiscal crisis shook everybody. So they went and hired a group of private industry people to bypass the city process. In doing so, they started to get the expertise they have now," Hewitt explained.

And this expertise is going to stand them in very good stead. Hewitt's office is working on centralized data bases that will allow all city agencies to get information they need. Green Dorsey gave as an example the Division of Real Property for the City of New York that has a complete handle on city-owned properties. The Sanitation Department needs the profiles in the data base to find out ownership information. "I need to be able to get that data base, but I don't need to own it or want the problem of updating it or even want a copy of it," Green Dorsey said.

Hewitt's group expects to put in a large local-area network, called City Net, that will provide access for all authorized micro users to citywide data bases. And that access will be provided with little of the resistance that micro users have met in the past. "Most agencies work with us because they have found that, with hindsight, many things we predicted have come true. They want to utilize our expertise because they found it has been more helpful than not," Hewitt said.

So while Hewitt works on a grand scale with the entire city his end user, Madnani has the same feelings about his end users. "I have constant meetings with end users. I want them to leave feeling they are in more control of what they want than they were when the meeting began. I encourage them to be very demanding. I say, 'This is your system. It's going to do things for you, not me.'"

Madnani has been very successful with end-user computing in the Department of Sanitation and sees more successes down the road. "I don't know of many things [in the city] that are following this philosophy," he said, with more than a hint of pride. □

White is a senior writer at Computer Resources Focus.

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**SPECIAL SECTION:
PC STORAGE**

Making The Purchase Decision



• BY • DAVID • P. • VELLANTE •

The advent of the IBM Personal Computer family has enticed a host of vendors to provide storage devices that improve system performance and functionality. There are several available options that vary according to the type and amount of storage required, physical size, performance, cost and ease of installation. Various devices are available from the personal computer vendor, the subsystem vendor and the retailer/dealer, so picking a supplier has become a confusing task. The ultimate decision depends on the proper combination of size, price and function.

The IBM PC and PC clones as well as systems available from companies such as Apple Computer, Inc. and Commodore Business Machines, Inc. have traditionally lacked the necessary storage devices to meet user demands adequately. For example, the first PC available from IBM supported no hard disk drive. Consequently, some forward-thinking individuals formed companies such as Alloy

Computer Products, Inc., Mountain Computer, Inc. and Iomega Corp. to supply add-on storage devices to the growing PC user community. These subsystem vendors have legitimized the personal computer as a competitive and useful system in the general business and scientific communities.

To appreciate fully the evolution of storage devices for personal computers, it is useful to examine the current and future state of each technology group: floppy disk drives, rigid disk drives, tape drives and the emerging removable and optical storage devices. In addition, the user should consider the trade-offs of each supply channel.

Storage options available directly from the personal computer vendor were originally confined to the floppy disk drive. The market for external Winchester disk drives running on personal computers was actually created by the subsystem vendor that initially offered add-on hard disks with capacities of around 5M bytes. These devices were expensive and bulky, but provided a previously

unavailable option to users of the IBM PC. The introduction of the IBM Personal Computer XT and its 5¼-in. 10M-byte Seagate drive marked one of the first personal computers that had a hard disk resident within the PC chassis.

This internal capability and its relative ease of use created a standard within the personal computer industry for the 10M-byte Winchester. The vast majority of installed hard disks on PCs are currently internal 10M-byte Winchesters purchased from a PC vendor. This vendor is most typically IBM, although others are gaining popularity.

The introduction of the Personal Computer AT is one obvious force behind higher rigid drive capacities, but the AT-compatible vendors will cull a greater share of the market with the AT than they did with the PC or the XT. This has implications in terms of the types of storage devices used on the personal computer. Vendors of IBM-compatible personal computers and vendors such as Apple are constantly seeking ways of differentiating from IBM: speed up the

processor, add more main memory, bundle software into the system's room and add other options such as an internal printer.

In addition, companies are discovering that by offering combinations of storage devices, they can vastly improve system performance and functionality. Effective mixes of floppy drives, Winchester drives and cartridge tape devices present interesting considerations to the end user.

A good example of this came with the introduction of the AT. The standard diskettes used in the PC and XT are not completely compatible with the 1.2M-byte high density drives used in the AT. A popular configuration among users is to add an optional XT or PC drive into the system box, thus allowing easy transfer of PC or XT floppy files onto an AT. The advent of the "half-height" form factor has made it possible to achieve this solution effectively and still allow room for a Winchester device and an internal cartridge tape drive.

Other innovations involving the use of floppy drives revolve

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around the 3½-in. floppy disquette drive. This device is gaining popularity in many applications, including the ruggedized and emerging portable/laptop markets. Both Hewlett-Packard Co. and Apple have initiated aggressive plans for the use of the 3½-in. drives as well.

Beyond the obvious advantages of size and durability (inherent because of the plastic casing), the device uses less power, which is attractive in sit-

uations where the PC power supply is constrained. Although the device has not lived up to original expectations of very high volume shipments, an expected endorsement from IBM in the form of a 3½-in. floppy-based laptop PC should provide good growth for the product.

Some problems will exist, however, because of the incompatibility of 3½-in. and 5¼-in. drives. A market will develop around the transfer of data be-

tween 5¼-in. and 3½-in.-based personal computers. These users will be served primarily by a floppy device that will connect externally to the PC.

As the installed base of these devices grows and the libraries of media increase, it is safe to assume that personal computer vendors will choose the floppy disk drive for distributing software, archiving

data and backing up low-end hard disks. Innovations will appear within each technology. These include higher capacities, lower profiles (such as the one-third height 5¼-in. drive used in the new Compaq Computer Corp. Portable), improved transfer rates and lower power consumption.

It is likely that the huge installed base of 5¼-in. media and 5¼-in.-based PCs will give this technology significant staying

power. Coexistence between different capacities and form factors will be the trend throughout the 1980s and into the next decade.

Like floppy drives, rigid disk drives have evolved over the years. The original XT, with its 10-Mbyte internal hard drive, has become an industry standard. The AT will continue to support the trend of internal hard disk drives.

IBM, however, has purposely limited the capacity of the AT in an effort to differentiate that device from the lower end of its System/36 line. The ceilings IBM has placed on the AT are a function of product positioning and not technology constraints. As a result, vendors of compatible systems are taking advantage of IBM's position by offering many hard disk drive options.

Unlike the floppy drive, which is bound by a few prevailing format standards, the Winchester can come in a variety of capacities depending on the application requirements of the user. Vendors of compatible equipment are employing lower end half-height devices as well as higher capacity Winchester. It is not uncommon to find Intel Corp.'s 80286-based systems with well over 85M bytes of on-line storage residing within the PC chassis.

Value-added resellers that specialize in areas of computer-aided design and manufacturing (CAD/CAM) and large data base intensive applications are finding requirements for storage capacities well beyond 10M bytes and 20M bytes.

Manufacturers of personal computer equipment are taking advantage of the emerging original equipment manufacturer (OEM) drives available from suppliers whose products range in capacity from 50M bytes to 170M bytes. These higher end drives, commonly referred to as closed-loop devices, not only provide higher capacities, but also greatly improve overall system performance if integrated properly. The result has been the migration of more disk-intensive applications to PCs.

The growing popularity of hard disk drives on personal computers presents users with the need to back up valuable data to tape. The preferred choice by system vendors is to

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use 4-in. and .15-in. cartridge streaming tape drives. While there is a market for reel-to-reel tape drives, these devices are more commonly used when access to mainframe tapes is required.

By contrast, personal computer vendors want to provide a solution that takes up a small amount of desk space, and for that reason, cartridge tapes are a natural. These devices are available in half-height form factors and will follow other form factor trends set by Winchester and floppy devices. Capacities vary from 10M bytes to greater than 60M bytes, serving applications such as full image backup of disk, file by file backup, software loading and distribution and archiving of valuable data. These drives have grown dependable and use media that is readily available. Typical prices are under \$1,000. Users will see more PC vendors supporting this standard, which is currently available from notables such as Compaq, NCR Corp. and Sperry Corp.

The range of storage devices supplied by personal computer vendors is certainly growing. Users have found that while drives from system vendors are typically more expensive, they are also reliable, compact and efficient. Users do not have other options when it comes to purchasing Winchester drives and tape drives, specifically the subsystem vendor.

The list of subsystem vendors that provide "plug and play" disk and tape drives for the XT and AT is enormous. Their expertise lies in making a storage device that basically plugs into a PC and provides increased capacity and functionality not commonly available from the system vendor.

Products such as disk drives with higher capacities than those available from IBM, tape drives, disk/tape combination boxes and drives using efficient software utilities are making life easier for the user.

An interesting application for a subsystem appeared with the introduction of the 10M-byte Hard-card from Plus Development Corp., a division of OEM supplier Quantum. The device has captured headlines in the trade press and has enticed other vendors such as Mountain Computer, Tandon Corp. and Western Digital Corp. to begin to manufacture similar products. The product resides on a board and plugs directly into the slots within the PC itself. Improvements to these card drives are in the form of drives with 20M bytes and more, which occupy only one slot in the PC. Users must pay a premium for these subsystem products; however, they are flexible and easy to integrate.

The slew of products in the low end Winchester market have provided users with a third purchase option. When price is the major issue and level of utility is of primary concern, the user should consider the add-in Winchester. For prices well below \$500, a PC user can purchase a 10M-byte or 20M-byte Winchester from a local retailer, dealer, value-added reseller (VAR) or mail-order house. Some precautions should be taken in terms of carefully selecting a drive that uses a standard ST/506 or ST/412 controller commonly available from companies such as Xebec Corp. or Western Digital.

Often users will be required to pay extra for a warranty and testing of this de-

vice, but hundreds of dollars ultimately can be saved by exploring this emerging phenomenon. In addition, users can also expect to see add-in cartridge tape drives available from retail outlets as this product becomes more oriented toward the PC.

Several future and current products also fit in to the spectrum of PC storage devices. Iomega's Bernoulli box has legitimized the market for removable drives on the PC, leading other vendors to announce removable products with similar capacities and access times. Vertical record floppies, stretched surface media drives and write-once and erasable optical drives will be seen this year. These devices face problems of undefined media and controller standards, making them somewhat unattractive to the PC vendor. For that reason, users can expect these

products to be brought to market by subsystem vendors whose expertise lies in producing a device that can plug into the PC, XT and AT.

The role of the retailer will be key in terms of getting this product to market. The VAR will also play an important role as users require specialized drives for such applications as security, large data bases and CAD/CAM.

As the personal computer industry evolves, the channels through which storage devices are purchased pose interesting questions for the user. The system vendor will continue to use half-height technology devices to provide the most flexible configurations possible because storage devices are becoming more of a factor in the overall sale of the system.

Subsystem vendors have been the nimble technology leaders, unafraid of unconventional products that, in fact, may provide the highest level of functionality and flexibility. The retail channel will continue to provide these subsystem products as well as lower cost alternatives with less emphasis on utility. Users should continually monitor these channels as they will serve to legitimize the variety of new technology products that are expected throughout the '80s as well as provide inexpensive options for existing devices. ■

Vellente is program manager of Storage Products Market Program at International Data Corp. (IDC), Framingham, Mass. Vellente monitors activity within the storage industry and provides market research to vendors of storage products.

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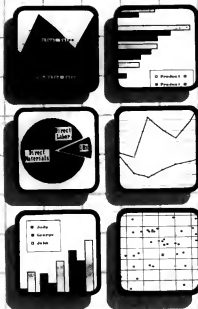
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SPECIAL SECTION:
PC STORAGE

Shifting Winds Of Storage



· BY · JOHN · R. · VACCA ·

As high-capacity and low-cost optical disk memory systems for personal computers move rapidly into the marketplace, standards and new design technology continue to evolve for components such as drives and media.

Optical disk systems offer enormous storage advantages for micros over previous media. Besides huge memory capacities, laser disks have a virtually limitless lifespan and because the read head mechanism does not touch the disk itself, head wear and head crashes are rare. In addition, the heads are not affected by magnetic fields.

Interest in new storage device technology for micros has centered on the following six types of optical data disks/drive devices:

- Digital Optical Disks, which record and read by means of laser beams and associated electronic circuitry.

- Compact Disk Read-Only Memory (CD-ROM), which are 4.72 in. (120 mm) in diameter, pre-recorded and designed for easy

replication and economical distribution of data bases and software programs.

- Optical Read-Only Memory Disks, which are slightly larger than CD-ROM at 5.25-in. (133.3 mm) in diameter. Unlike CD-ROM, optical ROM media typically operates in applications where faster access is important.

- Write-Once Disks, which are used for archiving and fast-access playback of very large data bases. They offer permanence, very high information density and random access to recorded information.

- Erasable Optical Disks, which can be written, read, erased and re-written repeatedly without practical limitation, just like a magnetic disk.

- Multifunctional Optical Disks and Drives, which can read, write and erase on all three types of media — optical ROM disks, write-once disks and erasable optical disks.

Optical disk storage technology for micros has matured rapidly over the past several years. A number of new applications are now feasible, awaiting commercial

development and market assessment. Integrated systems are now being built that allow a microcomputer to use all of the listed optical formats with one peripheral device including audio, video, read-only digital, write-once, prerecorded and erasable media.

Current activity among media and drive manufacturers is leading to the establishment of standards for disk design, formats, speeds, densities and readout methods. Such standardization will be critical to the proliferation of this efficient and new economical micro storage method.

■ Digital Optical Disks

There are three categories of optical storage products: erasable, write-once and prerecorded. Each of these products is recorded and read by means of laser beams and associated electronic circuitry. Digital optical disks may be used to store any form of written or encoded information, drawings, charts or photographs.

In the write mode, a laser beam forms a small pit on the surface of a digital optical disk, representing

a data bit. For reading, a lower power laser signal scans the disk to sense the presence of these pits reflectively. While the process is basically the same for the listed varieties of digital optical disks, there are important differences in capacity, format, access rates and application between disk types.

KnowledgeSet Corp., formerly known as Actventure Corp., of Monterey, Calif., for instance, has recently "developed the world's first digital optical disk encyclopedia in conjunction with Grolier Electronic Publishing." Steven D'Annolfo, Actventure's product marketing engineer, stated. The entire text of the 21-volume Grolier Academic American Encyclopedia now resides on a CD-ROM for access using the latest CD-ROM drives manufactured by companies such as Sony Corp. and Hitachi Ltd.

The text is displayed by Actventure's Knowledge Retrieval System (KRS). This system allows information to be accessed by topic, similar to a book's Table of Contents or through reference to a subject found in an index.



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This digital optical disk encyclopedia will cost about \$200 including software. A printed set of volumes will cost about \$650.

Another company that has made advances in the digital optical disk market is FileNet Corp. of Costa Mesa, Calif. The company has just signed contracts worth \$4.5 million for its digital optical disk-based office system.

FileNet's document-image processor digitizes the images from paper documents, storing them on a digital optical disk. "Most offices that handle large volumes of paper take several days just to process and store information in an orderly fashion," Ted Smith, founder, president and chief executive officer of FileNet, explained.

A FileNet document-image processor reduces the cost of storing one page of a document from \$1.08 on magnetic disk and 20 cents for manual filing to just 3.1 cents on a digital optical disk.

Recently though, the growing public acceptance of the Compact Disk Digital Audio System — a world standard here and abroad — has led media and hardware manufacturers to take a look at CD-ROM as an economical optical ROM size for digital storage combined with easy portability. The CD-ROM standard allows dense digital information storage that can represent words, pictures, sound, programs and data structures.

■ CD-ROM

CD-ROM has enormous digital data storage capacity. A single disk can store the entire text of the *Encyclopedia Britannica*. In other words, a single disk has a storage capacity equal to that of 1,200 floppy disks.

CD-ROM is prerecorded and designed for easy replication and economical distribution of data bases and software programs. The recording format is spiral, with a capacity greater than 600M bytes.

Integrated optical drives of the near future, some industry personnel speculate, will use a small disk because of the cost benefit economies resulting from easy portability. Manufacturers, therefore, may take a close look at CD-ROM for read-only applications in designing such drives.

CD-ROM uses drive equipment that is relatively simple and inexpensive. As a result of its low-cost, high-capacity mass data distribution medium, CD-ROM has opened up many new prospects. The CD-ROM format combination of capacity and economy makes it ideal for mass storage and distribution of data bases or program bases. Its ability to store information can make computers more user friendly and give software producers the opportunity to store many computer-adapted versions of the same program on a single disk.

Currently, several major manufacturers have been autho-

rized to build drives and media for CD-ROM in accordance with standards. The Library Corp. of Washington, D.C., has developed a system "that will allow you to have access to all Library of Congress English and foreign-language records," Michele Snyder of their Customer Service Dept. said. However, a three-year subscription to the English-language cataloging on compact laser disk costs about \$2,610 or \$870/yr.

■ Optical ROM Disks

Optical ROM disks have either concentric or spiral track formats. Optical ROM capacity can be as high as CD-ROM, 600M bytes per side. But unlike CD-ROM, Optical ROM media is typically operated in a constant angular velocity mode and, therefore, is used in applications where faster access is important. Optical ROM can be two-sided.

Reference Technology, Inc. of Boulder, Colo., pioneer/leader in Optical ROM technology, has announced two unique products for IBM Personal Computers and compatibles that combine the benefits of the CD-ROM. The Chasir Datadrive storage with the updating and editing flexibility of Iomega Corp.'s (Orem, Utah) removable magnetic cassettes in a single unit.

The units are called the Claxix Datadrive Plus Series 500/10 with 10M-byte cartridge capability and the Chasir Datadrive Plus Series 500/20 with 20M-byte flexible media capability. Both units use 12 cm CD-ROM optical disks with 550M bytes of permanent storage.

Prices of the new Claxix Datadrive Plus Series are \$4,900 for the 500/10 and \$5,400 for the 500/20.

CD-ROM and optical ROM are eventually expected to dominate the computer market for mass distribution of information such as data bases, medical and statistical data and so on. Distribution of data bases using CD-ROM or optical ROM may eventually replace some on-line (dial-up) research services because of potential economies of distribution and use.

It is likely that the relative simplicity and low cost of prerecorded optical media together with the cost savings of mass replication and distribution of optical disks will foster another phase of development for the PC in the near future. Many original equipment manufacturers are currently exploring the potential of optical read-only digital data disks for mass distribution.

■ Write-Once Disks/Drives

The write-once optical disk may be formatted or supplied blank, ready for nonerasable one-time recording by the user. It is commercially available in 5¼-in. and 12-in. diameters, with capacities from 200M byte side to over 1G byte side.

The write-once disk, also known as Direct Read After

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Write (DRAW), may be made with either spiral or concentric tracks. Write-once design can be used for archiving and fast-access playback of large data bases, offering permanence, high information density and random access to recorded information.

Designed to operate with the 525 Winchester optical disk drive is Colorado Springs-based Information Storage, Inc.'s (ISI) 100M-byte Superstore 2000, a 5¼-in. write-once optical disk cartridge. The data surface of the disk is encapsulated to prevent data loss due to dust and scratches. The complete system evaluation unit and media is priced at \$2,555.

"It is the first time in the history of computers that a mass media recording system can provide audit trails, data integrity and security with the necessity of

backup," A.W. Potts, MIS director of Continental Steel Corp., Kokomo, Ind., said.

Another pioneer in the write-once optical disk market is Optotech, Inc. of Colorado Springs. Optotech engineers have recently developed proprietary Direct-Read-During-Write techniques for data verification as well as read/write and tracking focusing servo systems, according to Laura O'Neill, inside sales representative for Optotech.

The Model 5984 optical disk drive, which uses Write Once Read Mostly technology, offers 200M-byte user capacity at a data transfer rate of over 2M bit/sec and an average access time of 131 msec. The complete Model 5984 optical disk drive evaluation kit costs \$3,000.

Write-once optical products are the only ones being shipped today in com-

mercial volumes by most manufacturing companies in the industry for digital data storage applications. Optimem, a wholly owned subsidiary of Xerox Corp., Sunnyvale, Calif., believes that 12-in. high-capacity write-once drives provide attractive solutions in applications where long-term, permanent on-line storage of archival information is mandatory.

■ Erasable Optical Disks/Drives

The latest technology in optical digital storage development is the erasable optical disk, also known as magneto-optic or erasable DRAW.

"Erasable optical storage yields new economies in on-line storage for local PCs as well as central life systems," Lynda Lasato, a marketing communications representative for Optimem, said.

Erasable optical disks feature very

high-density storage and merge optical and magnetic technologies to form a low cost per bit alternative to rotating magnetic memory devices. The process uses a precisely controlled laser beam to write and read discrete points in a manner similar to earlier optical storage disks.

In the write mode, heating with a precisely focused laser beam is combined with a local magnetic field to cause a polarity switch of tiny magnetic domains in the disk. The coercivity threshold (magnetic level of change) for a discrete point is triggered by this laser heating. Switched bit locations are approximately 1 micron in diameter.

Erasable optical disk is based on a magnetic light polarization phenomenon where the plane of reflected light is determined by the direction of magnetization. For reading, a lower power laser beam pinpoints the discrete location, and reflective analysis is used to determine the magnetic state of the recorded magnetic

"My karma is too heavy right now."

—Computer backup excuse #65

OK, maybe that's not the best excuse for not doing your backup.

But people can get understandably carried away dreaming up new excuses to get out of doing something that's perhaps slightly more exciting than watching ivy grow up a fence.

One way to make the tedious halfway tolerable is to let it run when you go out to lunch or a meeting.

How to back up is a considerably easier decision than to do it. It depends strictly on how much

memory you've got. For a limited amount of memory, floppies will do the job fine. For 5 to 10 Mbytes or over, data cartridge is the clear method of choice.

But however you do it, you should do it. No matter how heavy your karma is (even if you don't

know what it is).

To learn more about backup and other applications of the data cartridge, a 3M developed technology whose time has come, contact your local computer products dealer.

When you run out of excuses."



bit. When information is erased, individual bits are reversed using the same mechanism as for initial recording.

Erasable optical storage density is 10 to 1,000 times higher than conventional rigid disks or magnetic tape. In addition, erasable optical disks are less likely to be erased by stray magnetic fields. There is no danger of head crash or media wear because optical recording is contactless. Dust and dirt do not pose a serious threat to the media or to data integrity for an optical disk.

The capacity of a 5¼-in. erasable optical disk is between 200M byte/side and 400M byte/side, depending on the drive. This volume is equivalent to over 50 typical PC rigid disk drives or to hundreds of individual floppy disks.

Cost per bit for the erasable optical disk is potentially less than rigid drive figures, particularly because a single drive can access far more data than was previously possible. This immense capacity has particular significance for complex search tasks. It can bring the storage volume of a large mainframe computer system to small systems.

Also, much of the interest in optical disk drives today centers on 5¼-in. drives capable of handling erasable media. However, no drives of this class are currently commercially available, but a number of companies including those mentioned here have demonstrated prototypes of drives capable of operating with erasable magneto-optic media.

■ Multifunctional Optical Disks/Drives

A multifunctional optical disk drive can read, write and erase on all three types of media: optical ROM disks, write-once disks and erasable optical disks. In

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addition, it will also make possible systems that incorporate mass distribution, archiving and fast on-line access for communication, message handling, research, education, training and mass storage in a small, low-cost package with low-cost media. Applications for such capabilities range from home use to education, entertainment and business.

For example, on January 19, 1986, Information Access Co. (IAC) of Belmont, Calif., introduced a patron-oriented, current index on a multifunctional optical video disk covering documents published by the U.S. Government Printing Office (GPO). "Arta Zygielbaum, IAC's marketing manager, said. Called Government Publications Index, this reference system enables a user to find citations to publications issued by the GPO quickly. It allows access to several years of information by

subject, title, author and issuing agency. This index to the monthly catalog of U.S. Government publications has an annual subscription rate of \$3,500.

In addition, Optimum and 3M Co. (St. Paul, Minn.) have signed an agreement to develop the media and hardware needed to bring multifunction 5¼-in. disk drives for high-performance desktop systems into volume production within the next two years. Unlike the write-once drives, multifunction optical disk drives will be able to operate with erasable, write-once or read-only media interchangeably.

Optical Media Standards

When properly applied, standards in the data processing industry are beneficial to the users of data processing systems. For the full realization of these benefits, however, any proposed record-

ing standard should not suboptimize the application of available technology.

The most widely accepted standard to emerge in the industry has been ¼-in. GCR tape. This standard provided the means for achieving data interchange with improvements in the costs of storage; it soon became limiting.

However, a newly appointed Standards Committee by the National Information Standards Organization (NISO), Gaithersburg, Md., is developing a U.S. National Standard for the formatting of bibliographic data on the CD-ROM. Therefore, with the development of optical recording technology, you must learn from the successes and shortcomings of the past. We all must agree upon optimal standards that incorporate demonstrated technology, are not technology limiting and provide a vehicle for user migration.

Like magnetic storage technology, optical technology will develop into several product families. Competition will drive costs down. Follow-on versions of today's 12-in. media-based products will evolve, significantly enhancing their performance capabilities. Smaller, lower cost optical disk drives based on a multifunction 5¼-in. format and offering several hundred megabytes of capacity will evolve to satisfy the needs of the high-performance workstation market.

The relative low cost and flexibility of the compact disk drive and media make them an ideal choice for multifunction applications in the home or office. CD-ROM drives can be used with a digital audio disk for high fidelity music, with a CD-ROM disk as input for video games and as a data base or software program source in microcomputer applications.

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in the data
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industry are
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Corp. (IDC), forecasts in their 1984 research report, *Optical Disk Strategies for Electronic Publishers*, "by 1990, the U.S. installed-base of read-only optical disk players (including compact audio disk CD-ROM and single and multiuser video disk-based systems) in publishing applications will reach 742,700 units."

In addition, IDC, Framingham, Mass., predicts that "the market for read/write and erasable optical storage systems will reach over \$8.7 billion in 1990."

The drive and media technologies needed to bring these multifunction 5¼-in. drives to market are now under development at many high-tech manufacturing companies, especially the ones mentioned here. To support these activities, many firms signed development agreements with their competitors, like the recently signed development agreement between 3M Co. and Optimum.

Under the terms of most of these agreements, Company A will agree to develop, for instance, a drive capable of reading and writing to Company B's erasable, write-once and read-only optical media.

Company B will then supply Company A with volume quantities of magneto-optical disks as well as write-once and read-only media needed to bring this drive to market within the very near future, say two years.

Because of these agreements, many companies will have established unshakable developmental milestones for the drives, media and other futuristic storage devices that will take them well into the 21st century. □

Vacca is a free-lance writer in the area of information management and computer security, based in Topeka, Kansas.

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PC STORAGE

What The Users Are Using



· B Y · L E E · W H I T E ·

Just how important is backup, anyway?

There once was a supervisor of a word processing department whose operators did all the text processing for an entire \$90 million company using an IBM 8100. One day the system went down. With the aid of some IBM field engineers, both in person and over the telephone at 2 a.m., a system dump was performed and revealed that the read/write head had crashed. The next day the damaged parts were replaced. The field engineers informed the supervisor they were ready to put the backup floppy diskettes back into the system. The supervisor asked, "What backup floppy diskettes?"

Perhaps such poor planning sounds too ludicrous. It may indeed be ludicrous, but it is also too true. The supervisor went on to become an analyst in the MIS department and part of her job was to teach people to use microcomputers. She taught her students very well, and she always included a lecture on the importance of backup. She asked to remain

anonymous to protect whatever credibility she has retained.

Backing up information on microcomputers has taken on an importance that really wasn't foreseen five years ago. In 1981, microcomputers were an oddity in most companies. The IBM Personal Computer had just been announced. Here and there the occasional techies or farsighted accountants might have had an Apple Computer, Inc. Apple II or Commodore Business Machines, Inc. Commodore 64 on their desks. Even those who bought the original PC rarely had more than 256K bytes of random-access memory (RAM).

But by 1986, all that has changed. The personal computer without a hard disk is now rarely seen; today most business personal computers are configured with at least 640K bytes of RAM, and the 30M-byte hard disk is now standard on IBM's Personal Computer AT.

What is turning the tide toward backup is not, however, the size of memory or storage. The critical need for backup is pointed up by

what is being stored on hard disks. Key business information, now recognized as a corporate asset, is residing unprotected on those 30M-byte disk drives. And most MIS staffers are aware that hard disk drives are much more vulnerable to environmental disasters than their counterpart floppies.

Most microcomputer users today acknowledge the importance of backup. But along with that realization is the reality that backing up to floppy diskettes is time-intensive and can result in machine downtime.

As an antidote to the tedium involved with floppy disk backup of the critically important data stored on hard disk, many third-party vendors are coming out with relatively inexpensive, easy-to-use and often portable tape backup systems. In addition, some computer hardware vendors are offering their equipment with optional internal backup systems.

Backup storage for microcomputers is available in many shapes and forms. The most common methods employ magnetic media: floppy diskettes, fixed hard disks,

removable hard disks and magnetic tape. A hard disk drive with a removable disk offers both the storage capacity of a fixed disk drive and the transportability of a floppy disk.

However, the cost of a removable drive is considerably higher than that of a fixed Winchester drive, and the reliability of a removable hard disk is uncertain, according to Richard Newsome, executive vice-president of Sysgen, Inc., the Fremont, Calif., manufacturer of tape drives. For this reason, streaming tape backup seems to be the method of choice for most users.

"Streaming tape runs continuously as the disk is backed up. For example, a streaming tape drive using an industry-standard ¼-in. cartridge can record data at up to 5M bytes/min. In addition, streaming tape subsystems cost about one half the price of hard disk drives and offer extensive storage capacities, typically up to 60M bytes," Newsome explained.

Until recently, the appeal of streaming tape subsystems was hampered by the lack of standards

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for streaming drive interfaces and for physically formatting the data on the tape. Tape drives from different manufacturers had unique protocols for communicating with the host computer and distinct methods of formatting data.

But this incompatibility has changed due to the efforts of two industry groups: Quarter-Inch Cartridge Committee (QIC) and Working Group for Data Cassette Drive Compatibility

(D/CAS). Both groups have worked out key standards that relate to streaming tape drives: an important one is QIC 24, the recording format standard that provides for interchangeability of recorded 1/4-in. cartridges.

With the QIC standards, backup subsystem manufacturers can now be sure tape drives from different vendors will be compatible, both in terms of electrical interfaces and recording format. But more important,

Newsome said, the end user can anticipate that data cartridges will eventually be interchangeable among subsystems from different manufacturers.

Given the speed with which vendors are jumping into tape backup technology, it is surprising that users interviewed for the *Computerworld Focus* survey are taking their time in embracing

this technology.

Larry LaRock, manager of data processing training and development at the Automobile Club of Southern California, said the group in charge of the approval and "care and feeding" of microcomputers for the user area spends a great deal of time instructing users on the importance of backing up information. There is even an auditing group to make sure those departments with critical business

information on microcomputers do back up that information. But floppy disk backup has met their needs so far, and they have no plans to purchase separate backup devices.

Danielle Barr, vice-president of Corporate Systems for the Bank of New England in Boston and who oversees the installation and operation of more than 600 microcomputers, had an unfortunate experience with backup systems. A leading supplier installed a "backup tape drive system that promptly 'blew apart,'" causing data it was to have saved to self-destruct. While data had been backed up to floppy diskette, the system itself had not. The vendor tried a second system. It blew too.

Barr is too experienced to damn an entire technology for one bad system, but individual tape backup systems alone hold less interest for her than the bigger picture. While some Bank of New England users have brought in an Omega Corp. Bernoulli Box and wheel it from micro to micro, Barr sees one solution to backup in personal computer local-area networks. They have already installed a number of Proteon Associates, Inc. Pronet networks running Banyan Systems, Inc. network operating systems and find that the file server fills in nicely for backup purposes.

Lois Drumm, administrative manager at KMG Main Hurdman in Worcester, Mass., is another fan of networking. Although users are now responsible for backing up their own work on floppy disk, Drumm sees a time in the not-too-distant future when their Corvus Systems, Inc. network, installed primarily to allow sharing of a Xerox Corp. laser printer, will serve as a backup tool for the firm's many personal computers. However, using the network's hard disk for backup is not feasible right now because 18M bytes of the 46M-byte disk is used for the laser printer software alone.

David R. Streibinger, director of fiscal information systems for Empire Blue Cross/Blue Shield in Albany, N.Y., purchases and coordinates all the corporate microcomputers, whose number about 200. Streibinger explained that the firm's most critical computer information is claims processing, which is entered and stored directly on the mainframe. If a microcomputer user wants that information, it is downloaded to a micro, but not stored there.

Streibinger is looking into different methods for backup because users are not backing up their information on a regular basis, but he sees networking as the method of choice. "One of the critical pieces of networking is the management of the network, and a subset of that is backing up the files," he said.

While most of those surveyed look to tape backup to save time, Terry P. Helms, systems

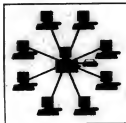
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department manager at the First National Bank of Colorado Springs, has an even better reason. "The auditors for our bank's holding company have suggested they are going to take a more active interest this year in how we are utilizing and protecting information on microcomputers," Helms stated.

Helms has only begun the search "on a peripheral level because the project doesn't have a completion date until the end of third quarter." However, he is leaning toward a portable streaming tape device, primarily because the micro is located in different parts of the building.

The same rationale is leading Jon Granger, manager of information systems for the Housing Authority of Milwaukee, toward portable streaming tape backup devices. "We have more than one personal computer at a remote location so we could back up fully once a month, and then take [the backup unit] from place to place," Granger said.

all have been done on a personal computer. So I'm inclined to wait," King said.

Another user waiting for optical disk storage technology to mature is George Ash, senior systems analyst with Metropolitan Life Insurance Co. in Wichita, Kansas. In the meantime, Ash is looking at a portable tape backup unit that weighs only 5 lbs or 6 lbs. Once each personal computer is equipped with a \$99 card, the device can be easily moved from unit to unit.

Even the big corporations whose micro number in the many hundreds are doing little in the backup arena. Dennis Lockard, manager of end-user support services at Corning Glass Works in Corning, N.Y., is considering putting backup systems in Corning's Far East sales of-

fices where microcomputers were recently installed. But he has found that backup is easily supported by floppy disk on an application-by-application basis for most micros at Corning headquarters.

Management at Corning, which has always been on the leading edge of micro technology, tries to anticipate problems. When a department demonstrates a need for microcomputer power, a staff member from end-user support services works with members of the requesting department in order to determine the best hardware and software for the job.

Dave Vellante, program manager for the Storage Products Market Program at International Data Corp. in Framingham, Mass., thinks 1986 will be the year of the tape drive and that Compaq Computer Corp. and Sperry Corp. have the right idea. "They've probably sold a hundred

thousand tape drives integral to their systems last year. It legitimizes a market when a company like Compaq endorses your product. It's time the personal computer vendors caught on," Vellante said.

However, it is whether the user community decides to catch on that will really define the tape backup storage market. And if the *Computerworld Focus* survey is any measure, the user community seems to be in no hurry to jump into what they consider an untested technology. The Housing Authority of Milwaukee's Granger has no desire to be a trailblazer, illustrating his thoughts with an old joke: "You know how you can tell the pioneers? Those are the guys with the arrows in their backs," he laughed.

White is a senior writer at Computerworld Focus.

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Even the big corporations whose microcomputers number in the many hundreds are doing little in the backup arena.

Granger and others, however, cite user productivity as the main reason for looking into fast methods of backup. "The volume of data is too substantial to have [users] spend time backing up on floppies. We could fill up a stack of floppy disks like a pile of pancakes and spend hours doing that. We want a high-speed, high-capacity device to which we can back up our entire disk file or certain directories," Granger explained.

This opinion was echoed by Stan Tumosa, systems manager in the Naval Material Quality Assessment Office at the Portsmouth, N.H., Naval Shipyard. Most of the personal computers are used by clerk typists who have other functions to perform and are, according to Tumosa, only semitrained. "I don't think they have the expertise, and [backing up] is pretty time-consuming," he said.

Laurie King, director of information systems at Braxton Associates, a strategic planning consulting firm in Boston, is also looking into microcomputer backup. But King is considering the newer and more expensive optical disk storage because her firm has been a beta test site for two optical disk storage device vendors. "All the work we do primarily turns out pictures. I'm looking at the laser-based systems that are coming onto the market because, in the long run, that seems like a really good alternative for us."

King was quick to point out that her firm is not jumping into anything too quickly, citing the experience of another management consulting firm that decided to manage its own records. "They were working in advance of the technology so they ended up writing their own programs. It was a gargantuan and expensive effort. If they had been able to wait two or three years, probably it could

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MICRO & MINI LINKS

Protocol Conversion For Micros

• B Y • N E A L • C H E C K O W A Y •

As users demand more power at the desktop, the search continues for links between microcomputers and minicomputers, often through the use of protocol converters.

For many small businesses, departments or work groups looking for computing power on something smaller than a mainframe, IBM's answer has been the System 34/36/38 minicomputers. System/34, with its large installed base, offers multitasking and supports up to 16 locally attached terminals and a maximum of 64 remote devices.

System/34's younger and more powerful cousin, System/38, is a general-purpose data processing system featuring advanced architecture and support for a full range of interactive workstation applications as well as traditional batch applications.

For users seeking more power, IBM introduced System/36, which provides up to 32 local devices and 64 remote devices. Running under the SSP operating system (like the other members of this processor family), System/36 provides memory expansion options ranging from 40M bytes to 800M bytes.

While the System/36 has met



criticism for its multiuser throughput and user response times, it is still IBM's best-selling offering for departmental processors — that is, systems that function as links or midpoints between mainframe and micro computing.

David Moschella, director of Systems Research at International Data Corp. (IDC), Framingham, Mass., estimates the installed base of System/36 at between 60,000 to 70,000 units and of the entire family at nearly 130,000 systems. "Although IBM may come out with larger and more powerful versions of System/36, it has certainly fulfilled a need for a general business computer for small businesses. Its future depends on the evolution of multiuser operating

systems for the IBM Personal Computer and how fast IBM can develop a viable and cost-effective local-area network," he said.

Like System/36, much of the marketplace for the PC was departmental at first and also targeted at the small business professional. But as IBM end users realized they had a large installed base of both System/36 products and Personal Computer XT's and Personal Computer AT's, they demanded a way to merge the two technologies. According to Ilene Goldman, manager for Workstation Program at IDC, well over one million System 34/36/38 CRT-type devices exist in the marketplace and sit on an estimated 7% of the desktops in the corporate

world, as of 1985. Moreover, an estimated 50,000 System 34/36/38 emulation boards for PCs were shipped last year, bringing the installed base of PCs connected to twinaxial cable to approximately 70,000 systems.

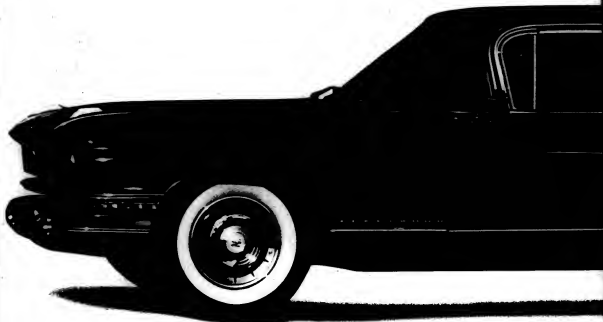
Another attempt by IBM to merge the somewhat competitive System/36 and PC technologies was its introduction of the System/36 PC in June 1985. "The System/36 PC has not sold well, however, because IBM's target market for the system is not clearly defined," Moschella said.

Conversely, this lack of focus, positioning and popularity for the System/36 PC is in sharp contrast to other System/34/36/38-to-PC connection strategies offered by IBM and other vendors for this processor family.

In the spring 1983, IBM unveiled the first PC add-on board to emulate the local 5251 terminal (Model 11). Connecting via twinaxial cable, it was a solution to System/34/36/38-to-PC integration, and IBM has realized moderate success with the product (estimates show IBM has installed more than 25,000 such connections to date).

But according to Gartner Group analyst Nancy Erskine, IBM clearly dominates in both the mainframe and PC environments, but

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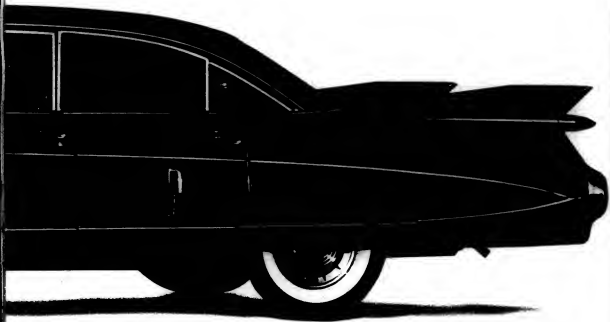
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MICRO & MINI LINKS

not in the middle tier. "The PC-to-System/36 connection is important for small businesses, remote job entry applications and departmental processing. Not only is the PC quickly becoming the choice for workstations, but people are buying the PC because they know vendors' strategies will allow it to connect to just about anything else," Erskine said. Other vendors have slowly entered the market, especially after IBM announced its strategy of positioning System/36 as a departmental processor. Many of these vendors came from the ranks of protocol converter manufacturers for 3270/mainframe/coaxial environments.

The protocol conversion market has grown significantly during the last eight years as computer users have demanded a way to link EBCDIC and ASCII worlds while realizing the connectivity benefits

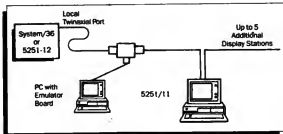


Figure 1. Twinnax Connections

that protocol converters offer. Acting as a foreign language interpreter, the main purpose of the protocol converter is to convert between the EBCDIC character

code of the System/36 and the ASCII character code of the PC. Terminal and printer emulation also are subsets of the protocol converter world.

Twinnax protocol converters/emulators perform two functions: They trick System/36 into thinking the attached PC is one of its own terminals; then they translate the information and commands sent by System/36 into PC data format. To appear as a valid device to System/36, the emulator must respond appropriately to all control messages sent by the host and be able to send the appropriate command to different types of PC devices while translating System/36 commands.

Protocol converters for the System/36 environment offer a variety of device emulations, often dependent on the specific mode of connecting. Typically, 5251 Display Station Model 11, 5291 Display Station (a lower-cost 5251-11 plug-compatible) and 5292 Color Display Station are supported. Alternatively, 5251 Display Station Model 12 may be emulated. Model 12 is intended for remote attachment to a System/36 communications adapter over a common carrier communications line using the Synchronous Data Link Controller (SDLC) line protocol at up to 9,600 bit/sec transmission speed. As a controller, its cluster features allow the direct attachment of up to eight printers and display stations.

For printer emulation, a number of models are generally supported: 5219, 5224, 5225 and 5256. The most common System/36 printer is the 5224 with a print rate of up to 240 lines/min. The 5225 can print at 560 lines/min. and the 5256 can generate 120 char./sec.

As noted above, the particular emulations supported sometimes depend on the specific methods of connectivity. Twinnax cable is the standard cabling technique for attaching peripherals to the System/36 environment. Unlike the coaxial cable found in mainframe environments, twinnax cable is not used in point-to-point applications, but rather to attach up to seven devices to a single line in a daisy chain fashion. This configuration usually provides a cost-effective cabling solution for the small systems office or work group. The twinnax cable itself originates from either the System/36 local controller or from a Model 12 Display Station (see Figure 1).

The decision to implement protocol conversion using twinnax cable or via an SDLC communications link may be based on price/performance and availability. If no communications lines are available for a particular application, the twinnax cable is the likely answer. If all accessible local addresses are occupied, the number of local workstations can be increased by installing a communications adapter. When several remote devices need to connect to System/36, it may be cost-effective to use RS-232 converters at that site.

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The PC then can function as a series of multiple terminals to a host that does not realize that it is only talking to one PC.

For board solutions, users typically have options to swap between sessions through "Alt" key combinations or an escape sequence, all controlled by the PC. Box solutions with multiple session capability can access a connection services menu that lets the user add or delete any number of host connections.

Another common feature is hot key functionality that allows the PC user to switch between DOS and terminal emulation mode with a single keystroke. This is beneficial for the Lotus Development Corp.'s 1-2-3 user, for example, who needs to access information from an accounts payable program running on the System 34/36/38.

Support for multiple sessions requires

that the user/installer set terminal address settings and the termination option (indicating that the device is the last one on a twinxial cable run). Typically, this is accomplished via a switch or jumpers on the emulation board products. However, a preferable approach for both board and box solutions is to put these parameters under software control.

While keyboards for the PC and the 5251/5291 have identical physical layouts, the assignments and functions of the keys differ. So seasoned users of either keyboard will have to learn the nuances of the other.

Some vendors provide a choice of either a PC keyboard mapping or a 5251 keyboard mapping, often supplemented by the option of custom keyboard mappings by the user. In addition, some vendors offer the useful feature of on-line

keyboard map help screens as well.

The PC and System 34/36/38 worlds grow further apart when printer emulation becomes a factor. Most dot matrix printers have compressed printing options, while only the 5224 and 5225 printers for the System 34/36/38 offer this function (the 5256 does not). Therefore, emulators that support only the 5256 printer will not be able to control compressed print from the host system. If a printer is placed in a PC printer mode before printing begins, a PC printer emulating a 5256 cannot perform compressed printing. This capability can be programmed in software or accomplished via the printer's front panel controls. Similar problems arise when using a letter-quality printer to emulate a 5219.

A popular feature now available from several vendors is a simulated printer control panel. This is a PC screen that represents the status lights and control buttons found on a System 34/36/38 printer, allowing the operator to check printer status, advance forms and bring the printer on- or off-line from the PC.

One of the more popular rationales for the PC-to-System 34/36/38 connection is as a way to transfer files between the two systems. IBM and third-party vendors now offer several methods. IBM has introduced the following three System 34/36/38 programs to enhance the PC:

- **File Support Utility**, which allows the PC to create and access a virtual diskette on the host that appears as a PC diskette. Using the virtual disk concept to transfer data, it involves software that runs on the System 34/36/38 and corresponding software running on the PC. The virtual disk is an area of disk on the System 34/36/38 that appears to the PC like a PC disk. Once the data is copied onto the virtual disk, it functions just like any other PC file giving the PC extended peripheral capabilities.

- **File Transfer Facility (FTF)**, which provides limited capabilities to extract information from a System/36 or System/38 for printing or use on a PC.

- **PC Support/36 and Support/38**, which offer more complete integration of the host and PC functions.

Most third-party vendors are working to support these three options.

Several other non-IBM software solutions are supported by most emulators and now have become de facto standards. One is Emulator Transfer Utility, a standard file transfer program for remote 5250 applications from Software Systems, Inc. Another is Laguna Laboratories' Decision Link, a data extraction and file transfer package that vendors offer as a substitute for support of IBM software.

Concurrently, several vendors are also offering homegrown versions of file transfer utilities. Most have factored desirable features into the product's functionality that may be beneficial to the end user who is accustomed to the vendor's menus, documentation and customer service staffs.

As the PC and System 34/36/38 markets converge, users will begin to define a number of parameters to determine which connection strategy makes the most sense for their particular situation.

Beyond weighing the differences between box and board solutions and the advantages of communicating via twinxial cable vs. the communications adapter, data processing managers must examine these factors: the number of remote applications and potential users, the need for features like file transfer, the utility of running synchronous or asynchronous modems and the functionality of a single vs. multiple port protocol converter.

A final consideration in planning and implementing future PC networks is how resourceful your PCs are today and what role they'll play in the near future as they become more closely aligned and integrated with IBM's small systems solution in the emerging automated office.

Checkoway is the director of marketing at Aviat Technologies, Inc., a Hopkinton, Mass.-based manufacturer of protocol converters, micro-to-mainframe links, network gateways and other data communications equipment. Research for this article was done by David Conti.

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TECHNOLOGY INSIGHT

High RISC Factors

• BY • STAN • KOLODZIEJ •



Reduced Instruction Set Computer (RISC) technology is an ironic acronym. Those companies coming out with computers using RISC architecture are confronting a shaky economy. They are also facing a computer market growing more cynical and resistant toward any new technological promises that might deliver more on paper than in practice.

RISC came into the commercial spotlight two years ago when Mountain View, Calif., computer maker Pyramid Technology Corp. introduced its RISC-based Model 90X minicomputer. Since then, RISC has gained more attention; it has also created an increasingly divided number of detractors and supporters.

So far RISC has been used within the sketchy no man's land of supermicrocomputers and low-end minicomputers — mainly departmental systems using 32-bit processor technology. IBM's recently announced single-user 32-bit Per-

sonal Computer RT workstation/microcomputer is an exception, but it is difficult to say if RISC will be used by other vendors in office microcomputing. RISC by its nature is an expensive research and development proposition without an extensive base of third-party software, unlike the present Intel Corp. 8088 and 80286-based MS-DOS office microcomputers. If anything, RISC will find a place in the booming computer-aided design and manufacturing (CAD/CAM) market for single-user workstations.

Part of the problem lies within the technology itself. The fact is each company with an interest in RISC tends to interpret RISC a little differently. Since the concept of RISC was first studied in IBM labs in the early 1970s, other companies have taken it and molded it to their own needs.

"To date most commercially available RISC systems are really not true RISC systems," explained William Zachmann, corporate vice-president of research at International Data Corp. (IDC), Framingham, Mass. "They're a compromise between the aim of a reduced instruction set and the need for more complex instructions in order for the systems to be of practical use."

The compromise Zachmann mentioned is what has been nicknamed Complex Instruction Set Computer or CISC technology, in reaction to the appearance of RISC. CISC is meant to embrace certain very large scale integration (VLSI) elements shared by all mainstream microprocessors such as the Motorola Corp. 68000 and Intel Corp. 80286.

A good example of a CISC-based machine is the recently introduced VAX 8600 high-end minicomputer from Digital Equipment Corp. The 8600 contains a set of several hundred instructions, many handling arcane mathematical tasks and not normally

used in commercial office applications.

Such apparent processing waste is a rallying point for RISC supporters. A rule of thumb known as the 80/20 rule posits that 80% of the time the average computer uses only 20% of its instructions. The most frequently used are the simple operations that can be performed at peak efficiency. Streamline, pare down crowded instruction sets and RISC vendors will prosper, RISC supporters say.

To increase computer efficiency, RISC supporters advocate a drastically reduced set of, at most, 100 instructions to handle the most common tasks. The result would be less processing overhead, increased speed and, hopefully, a less expensive machine.

There could be some hurdles to clear along the way, however. First of all, RISC detractors point to what they consider a major inherent RISC problem: The greater simplicity of a RISC processor does not eliminate the need for

complex functions.

RISC trades simplicity in the processor for complexity elsewhere in the computer (usually in the language compilers). Many of today's applications are multitasking, requiring complex subroutine call structures and concurrent operations. Because RISC usually does not operate directly on data in the main memory (instead only doing arithmetic and logical operations on data loaded previously into data registers), the result could be slower throughput in many programs. This could neutralize any speed advantage RISC supporters claim.

Ironically, many of the RISC-based computers to date have been targeted at the growing scientific, engineering and technical markets. True RISC architecture, however, probably would not include floating point arithmetic and decimal arithmetic operations, two major processing linchpins in these markets. To compensate, most RISC-based machines that have appeared combine RISC with pieces of more conventional technology, in effect producing hybrids.

"No pure RISC architecture is likely to be a viable commercial system," Zachmann concluded. "Calling systems offered by vendors RISC architectures is correct only if you understand that term to mean embodying some of the RISC concepts."

The question of what constitutes RISC technology is muddy, but in the end it might not be that important a factor in RISC's success or failure. Just as important, if not more so, are the marketing strategies behind RISC machines.

Tom Henkel, senior marketing analyst with the Yankee Group in Boston, cautions that RISC "is not a market unto itself. It has definite advantages in certain market segments. People didn't get excited about gate array technology a few years ago, although it has had

" "

So far RISC has been used within the sketchy no man's land of supermicros and low-end minicomputers — mainly departmental systems using 32-bit processor technology.

TECHNOLOGY INSIGHT

its impact. They shouldn't get that excited about RISC. RISC will find its space along with multiprocessors, parallel processing and others. I think there's too much of an impression given that RISC is either going to revolutionize the computer industry or fade quietly away. Neither will occur. RISC will coexist."

Frank Gens, analyst at IDC, also found fault in what he termed the misleading industry press perception that RISC would amount to a toe-to-toe battle between multiprocessing computers and RISC-based machines. Gens sees a strong RISC presence in the technical, scientific markets due to intrinsic RISC computational benefits. Instructions in technical computing are often 2 bytes or 4 bytes long and can be executed in one machine cycle (one instruction per machine cycle is a RISC ideal), while the heavy emphasis on office input/output instructions can run to 8 bytes, use several machine cycles and drain the advantages of RISC.

"

There's an impression that RISC will either revolutionize the computer industry or fade away? Neither will occur. RISC will coexist.

In software, the Unix operating system has provided a unifying factor for RISC machines. Fielding strong benefits in communications and the technical/scientific applications field, Unix is also suited to RISC's simplified architecture. The relationship is symbiotic. At the same time, Unix will benefit from the increased market exposure and the stress on improvement that RISC vendors will place on the Unix operating system.

"The more that computer systems become general in their applications," Gens added, "the more complex the instruction sets. The whole trend, however, is toward specialization of functions. Data bases and communications are handled separately in computers by separate processors. RISC can find niches as separate processors in such systems, handling applications that it's more suited for. The real problem is coming up with good managers to handle the traffic in such multiprocessing systems."

In order for RISC to gain market and vendor momentum, there has to be material evidence that the price/performance gains of RISC-based machines over CISC-based machines are big enough to justify the high development costs in producing and integrating the RISC technology into vendors' product lines. At first, it appeared those benefits might be there. Pyramid Technology's 90X minicomputer was a direct shot at DEC's VAX 11/780 departmental computing user base. The 90X hit its mark. Yates Ventures, Inc., a Palo Alto, Calif., market research firm, puts the number of installed DEC 11/780s at 440 in 1985, with Pyramid Technology not far behind at 300 installed 90Xs in 1985.

Pyramid Technology's latest offering, the 98X RISC-based superminicomputer, is another volley at DEC, this time at DEC's 8600 supermini, introduced in mid-1985. Though analysts generally tout the 98X as an excellent machine, DEC has won a psychological battle by eroding Pyramid Technology's previous RISC price/performance gain through its 8600, a machine based on more conventional CISC technology. A Pyramid Technology spokesman commenting on its battle with DEC simply said, "The fact that we're put in the same performance class as the DEC machines, at lower prices, means RISC is a success."

Prior to the beginning of 1986, if you looked hard enough, RISC could be seen popping up sporadically in the machines of established vendors such as Harris Corp., a Melbourne, Fla., minicomputer

maker; Convex Computer Corp., a Richardson, Texas, maker of superminis; and Fairchild Camera & Instrument, Inc., Melville, N.Y., which is introducing a RISC-based microprocessor chip.

Also appearing were some fringe RISC startup companies such as Ridge Computers, Inc. of Santa Clara, Calif., and MIPS Computer Systems, Inc. of Mountain View, Calif., both with ties to academic research labs. Ridge Computers has already introduced some 32-bit RISC-based machines and MIPS Computer Systems has licensed an experimental RISC-based chip in which several CAD/CAM equipment vendors have expressed an interest. In 1985, a Cambridge, England-based company called Acorn Computers Ltd. introduced a RISC-based microcomputer. These developments received quiet press coverage. The spot-

light was elsewhere, with good reason. Word had it that Hewlett-Packard Co. and IBM were about to unveil something big in the RISC arena.

IBM's relation to RISC was blurry. Though IBM began the initial research into RISC several years ago, the company insisted until the eve of its actual RISC-based product announcement this past January that RISC was only one of many different technologies it was tinkering with in its labs. In the summer 1985, however, IBM whetted the appetites of industry watchers when it previewed a RISC-based prototype workstation for the sake of some selected financial analysts. Rumor quickly went out that IBM would shortly be pumping at least one RISC machine into the market.

"In the past few years, DEC has been able to come out with better machines

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using more conventional processor methods," Henkel said. "Pyramid Technology's marketing pitch has been improved power/price benefits, but that doesn't apply as much anymore. DEC has proven that there's still a lot of room to cram more power on CISC-based chips."

At the same time, industry insiders were fueling the strong belief that HP would soon be introducing an entire line of RISC-based machines aimed at providing users with an orderly migration from the company's highly successful but aging line of HP 3000 minis to a new series of faster machines.

Neither company failed to deliver. In January, IBM introduced its line of RT Personal Computer 32-bit workstations based on RISC architecture and slated to

compete with other workstations in the engineering and CAD/CAM markets.

The general consensus on the RT PCs seems positive. The 32-bit microprocessors include 118 RISC instructions, run in 170-nsec cycles and process between 1.6 million instructions per second (MIPS) and 2.1 MIPS. More importantly, IBM made sure the machines would be complemented by a series of IBM and third-party developed software applications. It also made available a plug-in, Intel Corp. 80286 coprocessor to run PC-DOS office applications.

Though the RT PCs are engineering workstations, IBM spokesmen have given thumbs up to RISC as a viable technology in the office, presumably setting the stage for future RISC products from Big Blue aimed at this market.

A month after the IBM announcement,

HP introduced part of its line of RISC-based minicomputers. The HP 3000 Series 930 and 950 are touted by HP as 3000 upgrades with more performance punch than the current top of the line CISC-based HP 3000 Model 68. Avoiding the obvious connotations of the word RISC, HP instead chose to call its RISC architecture, Precision Architecture.

Reactions to the HP announcement were mixed. One thing is clear, however, regardless of how well HP's machines are received in the marketplace: The company's major commitment to RISC combined with IBM's apparent goal of a RISC growth path have at least temporarily put the vendors that have been playing wait and see with RISC. The architecture's bolstered credibility in light of IBM's and

HP's blessings could get more vendors involved.

"HP had to do something," said George Weiss, program director at the Cartner Group, Inc., Stamford, Conn. "Their [RISC] move was gutsy but necessary because their 3000 user base was beginning to erode. In performance, the old 3000 line was rapidly losing ground to DEC, and [HP] users were getting impatient. The timing to introduce RISC is good. Not only will they lead the market in the technology but they are laying the foundations to be very competitive a few years down the road. Also encouraging is the apparent 100% commitment they are giving to the [RISC] architecture."

Weiss saw two possible clouds that could rain on HP's parade. The first is HP's ability to make good its delivery date promises. "If there are substantial delays in delivering the new machines, users will not remain faithful forever," Weiss said. Another concern could be the performance of the software carried over from the old line of HP 3000s to run on the new RISC processors. HP, however, claimed that existing software will run at the same speed in the so-called compatibility mode of the new machines, without any loss in performance. (The software can then be recompiled — with utilities provided by HP — to run in native mode on the new machines to increase performance.)

"The performance in compatibility mode remains to be seen," Weiss added. "I think HP also has to provide conversion tools and support to make migration to the new machines as easy as possible for users. The company has to turn an unknown quantity into a known one."

Chuck Hill, a vice-president at the Boston office of Kidder Peabody & Co., Inc., predicted HP will do well by its RISC-based machines, but added the caveat that RISC will only play a minor part of HP's overall future success.

"But this is still a big step for the company and RISC," Hill explained. "They're going from a pseudo 32-bit architecture to true 32-bit architecture, they're positioning much more compatibility among their machines than most other [computer] vendors and they're remaining with their own custom semiconductor chips. The pricing of their machines will also work out to about \$50,000 per MIPS, very aggressive pricing. The only possible problem I see is their getting their RISC machines to perform input/output functions in the commercial area as well as they say they can."

Don Bellamy, an associate editor at IDC, claimed that HP had no choice but to come out with something bold. Lacking the marketing clout of IBM to be able to sell disparate machines and the womb-to-tomb support of the DEC Vax line, Bellamy reasoned, HP had to go for something unique.

Larry Lunetta, director of marketing and product management at Ridge Computers, which is aiming its 32-bit RISC-based minicomputers at the departmental computing market, thought the HP announcement was important, but said it must be kept in perspective.

"It's not going to make or break RISC," Lunetta concluded. "Users are the ones who are going to drive this [RISC] market, and they really don't care what you put in the machines. If it can get the job done a little faster, a little less expensively, they'll go for it."

Kolodziej is a senior writer at Computerworld Focus.

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UPGRADE STRATEGIES

Planning PC Upgrade Strategies

• BY • JOHN • O. • SAUNDERS •

An old adage of the computer industry says that user demands expand to fill all available processing and storage capacity. Users have an extraordinary ability to dream up ever more effective demands of their hardware and software. Who would have imagined three years ago, for example, that the 640K bytes of addressable memory allowed by the designers of the IBM Personal Computer would soon prove insufficient for the purposes of many sophisticated spreadsheet users? The astonishing rate of technological progress in the industry has been matched, if not exceeded, by these extreme (and sometimes bizarre) needs.

The cycle of new product announcements and rising user demands has created an unusual crossroad, at least within the IBM product line. Intel Corp., IBM's supplier of processor chips for the PC family, has announced that development of the successor generation of chips to the 80286 (the main CPU of the IBM Personal

Computer AT) is proceeding with 80386 and 80486 models. This new generation of processors offers several important technological advances over the 8088 chip of the original PC and the 80286 of the PC AT. Yet despite the fact that the 80386 and 80486 will not reach commercial production until the end of 1986 and mid-1987 at the earliest, it has been predicted there will be no operating system software available at that time to take advantage of their full capabilities. Thus, the inability of DOS to take full advantage of hardware capabilities in the AT will likely continue in future PC models.

At the same time, many organizations find their base of PC users has grown substantially in its range and sophistication of needs. A few years ago, many MIS/data processing and Information Center managers recognized their primary missions as being largely educational — if not evangelical — in nature. The installation of over 3 million PCs in U.S. businesses in the past three years caused a huge demand for basic instruction in their use. Most me-



dium and large organizations have responded, providing the necessary training and support. Yet while the educational mission continues, all organizations have some groups of users who for several possible reasons have already pushed their PCs to the limit.

Thus, data processing and Information Center managers are faced with a dilemma: How can they best meet the rising expectations of sophisticated users given the increasing rate of technological change and the expected disjunction between hardware and

software product enhancements over the next 12 to 18 months? The answer lies in the availability of powerful add-on products that can extend the capacity of the basic PC. However, the proper selection of these products vs. complete product upgrades depends on the characteristics of individual users.

Figure 1, Page 50 presents the main upgrade paths among the PC family of products. The figure shows less powerful but more established technology at the bottom and more powerful but less

UPGRADE STRATEGIES

established products at the top. Lines depict possible upgrade paths from the lowest basic PC through the most sophisticated respected PC: AT-486. Note that the products at the top of the figure do not represent machines that have been announced by IBM, merely likely representatives of future technology. The figure also contains information on the important performance and technical characteristics of products. Again, in the case of the 80386- and 80486-based products, this can only be conjectured based on reports in the industry press.

Figure 1 shows there are two basic possible upgrade paths for PC users. The left-hand path in the figure represents what I call the trade-up strategy within the IBM product line. By following this path, the user trades up through successively more powerful PC products. At the

of functionality, but it is also the most expensive. At each stage, the user must invest in a new hardware configuration. In going beyond the XT, the user must also invest in new software. In addition, trading-up is risky from a technical point of view because each level demands a new processing environment.

The right-hand path in Figure 1 represents an alternative though limited strategy to the trade-up. This pathway — which I will refer to as the add-on strategy — makes use of the open slots of the PC expansion bus to give users added functions. The add-on strategy can be initiated at any level of the product hierarchy. However, it only provides one possible upgrade path to a level of functionality roughly equivalent to the AT. For example, RAM expansion up to the maximum of 640K bytes of user-addressable memory is available for products costing between \$200 and \$500. Such products typically provide additional functions such as printer spoolers and RAM disks. In a similar fashion, 8086/8087 and 80286/80287 coprocessor boards, which essentially replace the existing PC central processor with a more powerful chip, can meet the need for additional processing speed for approximately \$900 to \$2,000. By making full use of these products, an XT can have its processing and RAM capacity boosted to the same range as the AT, roughly half the cost.

Thus, the add-in strategy provides an alternative and less costly means of achieving technical enhancements to the basic PC. Yet add-ons have one serious flaw: Their upgrade path is limited at approximately the level of the AT. This is because the new generation of processors will not likely be downward compatible. The 80386 and 80486 will probably operate at very high speeds and support advanced functions such as multitasking, multiuser environments and the addressing several gigabytes of RAM. Such advanced functions can only be achieved through a new architecture and advanced operating system software. The higher speeds of these chips will make them incompatible with hardware of lower levels of Figure 1. Advanced functions that fu-

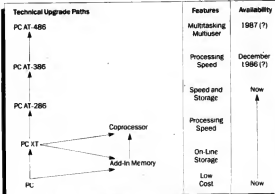


Figure 1. Main Upgrade Paths Among IBM PC Family

The trade-up strategy may be the simplest means of moving up the hierarchy of functionality, but it is also the most expensive.

first stage of this process, the user gains on-line storage capacity and additional random-access memory (RAM) with the Personal Computer XT. The user then gains processing speed, additional RAM and further on-line storage capability with the AT. Beyond that level, users can expect to gain even greater processing capacity, on-line storage and additional functionality as appropriate operating system software becomes available.

The trade-up strategy may be the simplest means of moving up the hierarchy

of functionality, but it is also the most expensive. At each stage, the user must invest in a new hardware configuration.

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ture operating software can provide will likely be incompatible at lower levels. If add-in boards offer a viable short-term (but strictly limited) upgrade path, what are the best specific situations to employ them? Naturally, users' needs vary. Selecting the best upgrade path is a matter of identifying the likely change in user demand patterns and matching these with available and expected technology.

Figure 2 presents a means for mapping usage typical sequences among general business PC users. Naive users who employ PCs for highly generalized tasks (such as word processing and simple spreadsheet analysis) are represented at the bottom of the figure. Users with more sophisticated demands appear at the next highest level. Users' demands at this level can be classified as either mostly spreadsheet, numerical analysis or word processing and other document preparation. At the next highest level, the right-hand branch further differentiates between large volume document preparation (a user group dominated by clerical personnel) and a more general group of professional staff using a variety of tools to prepare documents, graphics and analysis.

Figure 2 shows there are two types of advanced user needs: numerical analysis and data base applications. As a result, there are two types of hardware needs. Sophisticated numerical analysis requires powerful processing capacity and large amounts of RAM. The add-on strategy of upgrade is most appropriate. Data base applications, however, require fast and extensive on-line storage. Such capacity is not easily added to the XT or PC. As a result, upgrade to the AT is usually the best solution for such requirements.

Keep in mind, however, that both strategies may only operate for another 12 to 18 months. At that point, the advanced features of the PC-386 may be available. Users performing numerical analysis will require the extra speed and processing power of the 80386. Users performing data base applications will need the multitasking and multiuser environments provided by advanced versions of DOS.

Data processing and Information Center managers responsible for allocating the PC resource at their companies should take the following steps:

- Map the current and expected distribution of users along the outline of Figure 2.
- Plan to provide upgrades to those users on the upper left-hand branch via add-on and other peripheral devices.
- Plan to upgrade users on the upper right-hand branch via the AT. Leasing rather than buying equipment may be advisable given the short life span of these upgrades.
- Plan to upgrade high-level users to new PC versions after 18 months.

Saunders is a principal with the Boston Systems Group, Inc. He has published two previous articles on microcomputers for Computerworld and Computerworld Focus.

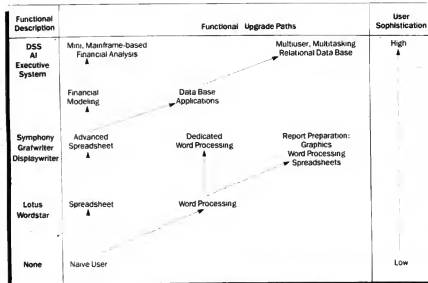


Figure 2. Typical Sequences For Mapping Usage Among PC Users

TECHNOLOGY INSIGHT

4GLs Migrate To Micros



• BY • JOSEPH • W. • ALSOP •

Micros now provide the power previously associated only with larger, far more expensive computers. IBM's Personal Computer AT and Personal Computer RT, Digital Equipment Corp.'s Microvax II and Unix-based supermicros offer minicomputer performance at microcomputer price levels. With networking and further improvements in hardware technology, microcomputers will compete with small mainframes in processing performance.

Users at group or department levels will want to use this power to set up multiuser information systems. However, to implement these systems without mainframe-size budgets, users and MIS professionals are turning to new fourth-generation languages designed for microcomputers.

Department-level systems are needed to process information shared by two to 20 or more users in one area within a larger organization. Such systems might monitor prospects and orders in a sales

office; track job applicants and open positions in a personnel department; or control projects, personnel and expenditures vs. budget in an engineering department.

Typically, department-level or branch office systems involve recording, processing and reporting data entirely within a section of

For example, a major southeastern telecommunications company uses high-performance data base and application development software to build systems for scheduling and tracking the engineering and construction of new telephone facilities. In the case of a particular job scheduling sys-

fort within each of 70 district offices.

Despite projected annual savings of nearly \$1 million, however, neither application was sufficiently important to the entire corporation to merit priority in the application backlog of the central MIS group.

Unless the users of a department-level application have a software package that fits both immediate and long-term needs, they — and their MIS or information center support staffs — must answer a significant question: What is the fastest, most efficient way to implement this application, taking into account the probable need for future changes and enhancements?

Fourth-generation languages provide a way for MIS groups using mainframes to meet the crushing demand for applications. Products such as Ideal from Applied Data Research, Inc.; Natural from Software AG; Mantis from Cincom Systems, Inc.; Focus from Information Builders, Inc.; and ADS/Online from Cullinet Software, Inc. are all designed to replace

”

Fourth-generation languages combine a high-level application building language with an underlying data base management system and offer significant benefits over building applications in standard programming languages.

the organization. Often such systems upload summary data to a corporate mainframe or download a subset of the corporate data to the department-level system. But most of the data is created and used entirely within the group, department or branch office for which the application is built.

tem, approximately one man-year of effort was required to build an application that will save 150,000 hours of clerical and supervisory time annually. Another system tracking statistical data on construction jobs replaced 10 to 12 manual logs and saved approximately 1,000 hours of manual ef-

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TECHNOLOGY INSIGHT

Cobol as the primary medium for developing applications at the mainframe level.

Typically, fourth-generation languages combine a high-level application building language with an underlying data base management system and offer significant benefits over building applications in standard programming languages.

One advantage is tremendous programming productivity. Experts cite a factor of 10 or better over Cobol or Basic in terms of fewer lines of code or man-days to complete an application. This has become the standard for fourth-generation status.

In addition, easy modification and enhancement let programmers respond rap-

idly to user requests for changes in the system. For example, the sales department in the example cited above might wish to add information to the customer file to track past purchase patterns by product line.

In addition, end users of fourth-generation language applications can easily access data to answer queries or produce special reports. In many cases, end users have built entire applications with minimal MIS involvement. Some fourth-generation languages have recently emerged in the mainframe world as total replacements for conventional programming in Cobol or other third-generation languages, even for application systems with many on-line users and large-scale data bases. Only in the past few years have mainframe software suppliers been able to meet the challenges of providing

all the capabilities of Cobol in a high-level environment while attaining performance comparable with that of traditional programming languages.

When it comes to evaluating fourth-generation languages for use in department-level applications, users and MIS professionals should consider the following evaluation criteria:

- Is the application going to be implemented by end users alone, end users with MIS consulting assistance or by MIS professionals? If the answer includes end users, then the choice of application development tools should be weighted toward tools more suitable for end users.

- Does the fourth-generation language under consideration provide full multiuser capability with automatic data base recovery? If not, how will recovery from system failures be handled in a rela-

tively complex multiuser or networked environment?

- Can the fourth-generation language operate on a variety of machines and operating systems so that the user is not constrained by an initial hardware choice? Moreover, can the user move the application to more powerful systems or networks as the use of the application and the size of the data base grow?

- Does the fourth-generation language offer good performance on microcomputers, particularly in a multiuser transaction processing system? Can it provide this performance without a substantial investment in additional hardware resources?

- Does the fourth-generation language offer interfaces to analysis, decision support and presentation tools such as spreadsheets and graphics packages?

The answers to these questions will give users the information that they require to evaluate and choose a fourth-

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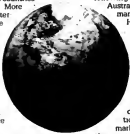
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Micros offer the potential of a richer end-user interface, if the fourth-generation language used offers the appropriate features.

generation language successfully.

There are many advantages to transporting fourth-generation languages to department-level microcomputers. Fourth-generation languages take advantage of low-cost hardware that may already be in place, thus saving on cost and compatibility. Even if hardware must be acquired, economics of microcomputers have driven the cost per user for a multiuser microcomputer system or PC network below typical mainframe costs per user.

The decentralization of the application development process brings the user who has the need close to the actual building of the application and may permit the user to build the application independently, with only advice and assistance from MIS.

Fourth-generation languages localize application development and remove the application from the backlog that exists in most centralized MIS departments. Department-level applications in the months-long or years-long queue of applications awaiting MIS attention are particularly likely to take second place to maintaining and enhancing of core corporate information systems used by the entire organization.

Micros offer the potential of superior responsiveness and a richer end-user interface, provided the fourth-generation language used offers appropriate features. Cost-effective local hardware lets more resources be devoted to making flexible screens with extensive graphics, color, help facilities and so on. These features help motivate users to take advantage of an application and reduce the time and cost of training new users.

TECHNOLOGY INSIGHT

Depending on the fourth-generation language selected, it may be possible to port applications to a wide range of machine types and operating systems. An application can start by serving a single user on a PC, then migrate to a multiuser system or a network configuration, possibly running a different operating system, all without modifying the application.

"

Department-level computing is taking its place between main-frame applications and PC-based personal productivity applications.

To succeed on microcomputers and local-area networks, vendors of fourth-generation languages must recognize the differences between the mainframe MIS environment and the microcomputer environment when developing products for department-level end users.

There remains a disparity in computing resources between micros and main-

frames. Although micros are gaining rapidly, particularly in CPU performance, mainframes still provide more "horsepower." These differences are noticeable particularly in access times and transfer rates of disk drives, intelligence of input/output controllers and efficiency of operating systems for transaction processing.

It is unlikely that a fourth-generation language with apparently good performance on mainframes can simply be re-coded to run on a micro. More fundamental redesign will be necessary to make a micro fourth-generation language perform at a level acceptable to micro users accustomed to very responsive systems.

Mainframes and micros also contrast in ease of use, both for the application developer and user. People who customarily work in a microcomputer environment filled with a rich, high-bandwidth screen interface will often find mainframe software comparatively difficult and frustrating, even if the software were designed for end users rather than MIS professionals. Mainframe fourth-generation languages designed originally for hard-copy terminals or 3270-type displays will have to be enhanced substantially to take advantage of a PC-style interface.

Multiuser capability must be coupled with automatic recovery. A multiuser system maintaining a sizeable data base and accessed by an entire department of users must be a robust, fail-safe information system.

Loss of data base integrity in such an environment creates far more disruption for users who rely on the system than loss of a single-user data base on a floppy

disk PC. The need for fully automatic data base recovery in fourth-generation language for department-level information systems cannot be overemphasized. Automatic recovery "crash-proofs" all applications implemented in the fourth-generation language. It prevents corruption of the data base and major loss of data that might otherwise occur when power is lost, the hardware or operating system fails or unskilled end users mistakenly turn off the equipment in the middle of a data base update.

Automatic data base recovery is crucial in a department-level information system running in an end-user environment, without access to highly skilled MIS personnel capable of repairing the consequences of a failure and restarting the system. In particular, products designed originally for processing queries and reports or for single-user situations will be hard pressed to accommodate the requirements of on-line transaction processing in a multiuser environment.

Department-level computing is taking its rightful place in the information system hierarchy, between mainframe applications and PC-based personal productivity applications. The fourth-generation language tools users and MIS professionals use to build these applications must combine capabilities drawn from both the mainframe and PC worlds, namely:

- Automatic data base recovery and sophisticated multiuser features borrowed from the mainframe environment.
- A rich user interface that takes advantage of PC strengths such as color, graphics and windowing.
- Sufficient ease-of-use so that users may participate in the initial applications development effort by implementing their own enhancements and modifications.
- Easy end-user access for special queries and reports.

Application transportability among the full range of hardware and operating system configurations that might be used to implement department-level applications.

Efficient use of the hardware capabilities offered by microcomputers.

The use of proper fourth-generation languages for department-level applications will provide users and MIS professionals with a wide range of benefits such as the following:

- Lower cost application development and enhancement, with greater user input and likelihood of user acceptance.
- Lower expenditures for hardware to support the application.

Applications that present a superior user interface, resulting in quicker acceptance and shorter training times.

Applications that permit direct end-user access, further enhancing user satisfaction and reducing MIS support costs.

Powerful multiuser microcomputer configurations and fourth-generation languages that can rapidly create easy-to-use applications are a natural partnership that will find wide applicability in many organizations.

Also is cofounder and president of four-year-old Data Language Corp., which builds and markets high-level application development tools for multiuser microcomputer, supermicro and minicomputer environments and is headquartered in Billerica, Mass. Also has 20 years' management and technical experience in the computer industry.

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A. Please check the business industry in which you work: (check one)

- End Users
1 ☐ Manufacturer (other than computer)
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6 ☐ Government -- State/Federal/Local
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8 ☐ Mining/Construction/Personnel/Railroad
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10 ☐ Manufacturer of Computers, Computer-Related Systems or Peripherals

11 ☐ Computer Service Bureau/Software/Planning/Consulting

12 ☐ Computer Peripheral Dealer/Distributor/Retailer

13 ☐ Other Vendor _____ (please specify)

B. Please check your main job function: (check one)

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Make these "people" laugh, and you could win \$100 worth of software.



Announcing the 1986 Computerworld button contest!

Every year, as all you button freaks know, Computerworld distributes tens of thousands of buttons at trade shows around the country. For several years now, against our better judgement, we have been letting you, our readers, write these buttons. To our surprise, you have written some good ones (like those shown here). So, we're doing it again.

We're looking for a few good slogans — witty, relevant, **SHORT** (these are small buttons), and at least moderately clean. You may send in your entries on the form below or a copy.

But you may **NOT** send us everything that comes into your head. Our offices aren't big enough to handle all that paper! Please take the time to narrow your ideas down to the two best you can come up with (test them on your friends).

All entries will be shown to our panel of judges, who will be tied to their chairs until selections are complete. Six winning slogans will be picked, and everyone who sent in one of those slogans will be eligible for a prize. If you are the only one to send in a winning slogan, you win the prize. If more than one person had the

same intelligent idea, we'll pick the prize winner out of a hat. Prize winners will receive a \$100 certificate good towards the purchase of software from a friendly neighborhood computer store.

All decisions of the judges will be final, and no representations as to their competence, skill, or sense of humor are being made. All entries will become the property of CW Communications/Inc. Deadline for entries is May 2, 1986 at our offices in Framingham, MA.

Is your
brain
as good as
your baud?
COMPUTERWORLD

Disk
bug's
for you.
COMPUTERWORLD

To VAR
is human,
to OEM
divine.
COMPUTERWORLD

YES, I'd like to enter Computerworld's ridiculous button contest. My two slogans are written below. I understand the rules above, and realize that these entries will become the property of CW Communications/Inc. I hope your judges can read!

Name: _____
Company: _____
Address: _____
City: _____ State: _____ Zip: _____
Phone (in case I win): _____

SEND TO: Nancy Langmeyer, Computerworld, Box 9171,
Framingham, MA 01701-9171.

Judge
Greene
is a
Bell Buster.
COMPUTERWORLD

Smile
if you
fondle
floppies.
COMPUTERWORLD

I heard it
through the
tape drive.
COMPUTERWORLD

PRODUCTS

Compaq Computer Corp. Offers Three Models Of Portable II

HOUSTON — Three models of a new portable computer have been unveiled by Compaq Computer Corp. The three models of the Compaq Portable II are claimed by the company to be 30% smaller, 17% lighter and 400% faster than Compaq's Intel Corp. 8088-based Portable and Plus portable computers.

Using the Intel 80286 microproces-



80286-based Compaq Portable II

sors running at speeds of either 6 MHz or 8 MHz, the three models reportedly can run the most popular MS-DOS-based business software up to five times faster than the IBM Personal Computer, the IBM Personal Computer XT and 8088-based compatibles.

Model 1 includes 256K bytes of main memory, one one-third height, 360K-byte floppy disk drive, two expansion slots and standard interfaces for a parallel printer, asynchronous communications, red-green-blue (RGB) color monitor and composite video monitor. Model 2 also offers two 360K-byte floppy disk drives while the Model 3 also includes 640K bytes of main memory, a single 360K-byte floppy disk drive and a 10M-byte hard disk drive.

Model 1 is priced at \$3,499, Model 2 at \$3,599 and Model 3 at \$4,799. For more information, contact Compaq Computer Corp., 20555 FM149, Houston, Texas 77070.

Circle Reader Service Number 229

PC Interface Introduced

SANTA CLARA, Calif. — A software product that lets users of IBM PCs and compatibles to communicate with IBM and DEC host application programs has been introduced by Ungermann-Bass, Inc. The company said the 3270 Personal Connection Interfaces with Microsoft Corp.'s Networks-based file and print servers and PC applications through its Net/One local-area network.

According to the company, the 3270 Personal Connection operates in conjunction with the Net/One Personal Connection Network Interface Unit (Personal NIU) and the Net/One NIU-74 to allow IBM PCs and compatibles to connect to any IBM 3274 controller. The program is available in two models: 3270

Personal Connection Model 1 and Model II. Both programs, according to the company, only need the Personal NIU for network connection.

The company added that while running Model 1, the PC emulates an IBM 3278 or 3279 terminal, while a hot key allows toggling between a host session and a PC session. The Model II enables a user to either connect to multiple IBM host systems viewing up to four applications simultaneously or to a DEC host to run two DEC VT100 terminal sessions at the same time. Model I costs \$95, Model II \$595. Contact Ungermann-Bass, 2560 Mission College Blvd., Santa Clara, Calif. 95052.

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Instant Forms Plus Debuts

UPPER SADDLE RIVER, N.J. — Western Union Telegraph Co. has introduced Instant Forms Plus, a package of software utility programs that enables users of the company's Easy-link data communications service to create, modify and transmit electronic business forms.

Instant Forms Plus, designed for IBM Personal Computers and compatibles, can be used with Instant Mail Manager, Western Union's IBM Personal Computer and compatible communications software package that integrates word processing, address lists and message file management on a single floppy disk drive. The company claimed that Instant Forms Plus can also be used with most communica-

tions software packages.

Included are six other stand-alone software utilities: a conversion utility that changes binary files into ASCII text files; two file management utilities called split and concatenate; the offline printing utility; the flip CRT, enabling users with monochrome and color graphics cards to switch between the two; and a purge utility that permanently removes a file from a floppy disk or hard disk drive.

Instant Forms Plus is priced at \$100 alone, or \$225 when purchased together with Instant Mail Manager. Contact Western Union Telegraph Co., One Lake St., Upper Saddle River, N.J. 07458.

Circle Reader Service Number 231

Prime Offers PC Option, Link

NATICK, Mass. — Prime Computer, Inc. has introduced two products: an IBM PC option for its PT3000 computer terminal and Primelink, a software link between MS-DOS and PC-DOS-based PCs and a Prime Computer 50 Series computer.

Prime Computer said its PC option is a two-board and system module upgrade to the PT200 terminal, the boards mounted inside the terminal and connecting the PC system unit hardware. The PC base system module sits under the terminal and is attached to the boards by a connecting cable. The company added that users can switch back and forth between PC-DOS 2.11 and programs running on Prime Computer's Primos host operating system without disrupting operations. The PC option includes an Intel Corp. 8088 processor with a socket for an Intel 8087 numeric coprocessor, 256K bytes of expandable memory, a serial printer port and connecting cable.

With its Primelink communications software, the company said users can increase storage capacity by storing PC files on the host systems. Users can also edit file PC WP documents on their host Office Automation System by sending these documents between PCs and the Prime host.

The PC option consists of either a dual 360K-byte drive model with 256K bytes of main memory at \$2,290 or a 10M-byte hard disk model with a single 360K-byte

floppy disk drive, 640K bytes of main memory, parallel printer port and clock/calendar software for \$3,690. An optional expansion board with 384K bytes of main memory made for the dual drive PC model is also available for \$550.

Primelink is available in four host versions that are priced from \$2,250 to



Prime's PC option to PT200 terminal

\$10,250, supporting from five to more than 15 concurrent file transfers.

The PC Primelink version is priced at \$60 for each PC connected to a 50 Series host.

For further information, contact Prime Computer, Inc., Prime Park, Natick, Mass. 01760.

Circle Reader Service Number 232

Unix-Based Workalikes Are Unveiled

SANTA CRUZ, Calif. — The Santa Cruz Operation, Inc. unveiled two Unix-based workalikes of major DOS applications: SCO Professional, a workalike of Lotus Development Corp.'s 1-2-3 and SCO Postbase, a workalike of Ashton-Tate's Dbase II.

SCO Professional offers 1-2-3 functionality including integrated spreadsheet, data base and graphics. Existing 1-2-3 files and floppy disks can be read directly while DOS-readable information is regenerated to maintain full flexibility. The program also offers more query fields, larger worksheet space, full-preview character graphics support and sparse matrix memory management for optimal spreadsheet storage, the vendor said. SCO Postbase provides Dbase II

functionality and is both language and data file compatible with its DOS counterpart, including full macro usage. The package can run Dbase II programs in multitasker mode without modification while providing record- and file-level locking to prevent data base corruption resulting from multitasker access, said the manufacturer.

SCO Postbase was developed with Fox Software, Inc., costs \$795 for the IBM PC AT and AT-compatible and AT&T's PC 6300 Plus. SCO Professional, developed with VIP Technologies, Inc., runs on the same computers as SCO Postbase and costs \$795. Contact The Santa Cruz Operation, P.O. Box 1900, 500 Chestnut St., Santa Cruz, Calif. 95061.

Circle Reader Service Number 233

PRODUCTS

AT&T's Products Integrate PCs With Digital Telephones

MORRISTOWN, N.J. — AT&T recently unveiled a family of hardware and software products to integrate its PCs with digital telephones.

With the PC/PBX Connection, a user can perform voice, data and PC applications simultaneously and access communications management functions unavailable with only a PC or private branch exchange (PBX). According to the vendor, the products also provide an element of multitasking to the single-user MS-DOS or PC-DOS operating system.

There are two basic hardware configurations for PC/PBX Connection applications: the 7404D PC cartridge for basic functions and the PC expansion card for full-function capability. The 7404D cartridge configuration consists of a plug-in PC feature cartridge for the AT&T 7404D voice/data telephone and an MS-DOS or Unix software package. The con-

figuration will support data communications up to 9.6K bit/sec.

The full-function arrangement consists of PC expansion cards and software packages for MS-DOS or Unix.

The 7404D package, now available, costs \$175 for the DOS version, \$200 for Unix. The full-function arrangement costs \$700 for DOS, \$825 for Unix. It will be available for the AT&T PC 6300 and 6300 Plus in May. For the AT&T Unix PC in August. Contact AT&T Information Systems, Room 833E, 1 Speedwell Ave., Morristown, N.J. 07960.

Circle Reader Service Number 234

Apple Offers Macintosh Plus PC

CUPERTINO, Calif. — Apple Computer, Inc. has introduced the Macintosh Plus PC with 1M-byte of main memory and an 800K-byte double-sided floppy disk drive. In addition, the Macintosh Plus has a built-in Small Computer System Interface (SCSI) port for connecting high-speed hard disks, tape backup systems and other peripheral devices.

The company said the Macintosh Plus uses a Ram cache technique that enables software applications to load, run and quit up to twice the speeds possible without the Ram cache. In addition, the machine's new operating

system contains a hierarchical filing system (HFS) that streamlines the job of locating and working with the documents, the company claimed.

The Macintosh Plus costs \$2,599. Macintosh Plus upgrade kits for Macintosh 128K and 512K owners are also available. The disk drive kit costs \$299; the logic board kit is \$599 for upgrading a Macintosh 512K and \$799 for upgrading a Macintosh 128K.

For further information, contact Apple Computer, Inc., 20525 Mariani Ave., Cupertino, Calif. 95014.

Circle Reader Service Number 237

Samna Announces New Version

ATLANTA — Samna Corp. has announced the development of a new version of Samna Plus to operate on the IBM PC RT, the 32-bit scientific/engineering multiuser multitasking workstation based on a reduced instruction set computer (RISC) architecture.

The new version of the software, which includes word processing capability, spreadsheet and the Samna Word Manager, contains all the features of the DOS stand-alone version, including support for Data Interchange Format file translation and Document Content Architecture reusable form text. In addition, it contains features that take advantage of IBM's multitasking multiuser operating system. The product executes shell commands, supports the IBM PagerPrinter, supports five different terminals, contains a terminal emulation program and supports windowing, allowing users to access Samna Plus via a mouse. Samna Plus for the PC RT costs \$1,295 and will be available in the third quarter 1988. Contact Samna Corp., 2700 N.E. Expressway, Atlanta, Ga. 30345.

Circle Reader Service Number 235

Shortpak Unveiled

IRVINE, Calif. — Ast Research, Inc. has introduced Shortpak, a half-size memory expansion board that adds up to 576K bytes of random-access memory (RAM) to the IBM PC, PC XT, Portable PC, 3270 PC and PC-compatible computers.

Shortpak will be available in three configurations: 64K bytes, 256K bytes or 384K bytes; however, users can combine configurations for RAM combinations ranging up to 576K bytes on a single board, according to the vendor.

Available immediately, Shortpak is priced at \$245 for 64K bytes, \$395 for 256K bytes and \$495 for 384K bytes. For further information, contact Ast Research, Inc., 2121 Alton Ave., Irvine, Calif. 92714.

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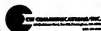
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April 28-May 1, Atlanta — **Comdex/Spring '86**. Contact: Conference and Exposition Producers, 300 First Ave., Needham, Mass. 02194.

April 29-May 1, Long Beach, Calif. — **Artificial Intelligence and Advanced Computer Technology Conference and Exhibition**. Contact: Tower Conference Management Co., 331 W. Wesley St., Wheaton, Ill. 60187.

May 5-6, Stamford, Conn. — **Second Annual Artificial Intelligence Conference**. Contact: Gartner Group, Inc., P.O. Box 10122, Stamford, Conn. 06904.

May 5-7, San Francisco — **EDP Software Maintenance Conference**. Contact: USFPA, 1620 Elton Road, Silver Spring, Md. 20903.

May 5-8, Washington, D.C. — **Experts on Networks**. Contact: Technology Transfer Institute, 741 Tenth St., Santa Monica, Calif. 90402.

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May 11-15, Anaheim, Calif. — **Computer Graphics '86**. Contact: National Computer Graphics Association, Suite 200, 2722 Merriell Drive, Fairfax, Va. 22031.

May 12-13, Nashville — **Personal Computing Conference**. Contact: Gartner Group, Inc., P.O. Box 10122, Stamford, Conn. 06904.

May 14-16, New York — **Distributed Data Base: How to Integrate Data in a Multivendor Environment**. Also, July 7-9, San Francisco. Contact: Software Institute of America, Inc., 8 Windsor St., Andover, Mass. 01810.

May 14-16, Nashville — **Small Systems Conference**. Contact: Gartner Group, Inc., P.O. Box 10122, Stamford, Conn. 06904.

May 14-16, Los Angeles — **Information Management Exposition and Conference**. Contact: CEG Client Services, 999 Summer St., Stamford, Conn. 06905.

May 19-21, San Francisco — **Hammer Forum West**. Contact: Hammer Forum West, 5 Cambridge Center, Cambridge, Mass. 02142.

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